ANNUAL REPORT

OF THE

BOARD OF REGENTS

OF THE

SMITHSONIAN INSTITUTION,

SHOWING

THE OPERATIONS, EXPENDITURES, AND CONDITION OF
THE INSTITUTION

FOR

THE YEAR 1879.

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FORTY-SIXTH CONGRESS, SECOND SESSION.

In the Senate of the United States,
May 22, 1880.

The resolution to print extra copies of the report of the Smithsonian Institution for 1879 has been agreed to by both Houses to read as follows:

Resolved by the Senate (*the House of Representatives concurring*), That fifteen thousand five hundred copies of the Report of the Smithsonian Institution for the year 1879 be printed; two thousand five hundred copies of which shall be for the use of the Senate, six thousand copies for the use of the House of Representatives, and seven thousand copies for the use of the Smithsonian Institution.

Attest:

JOHN C. BURCH,
Secretary.

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LETTER

FROM THE

SECRETARY OF THE SMITHSONIAN INSTITUTION,

ACCOMPANYING

The annual report of the Board of Regents of that Institution for the year 1879.

MARCH 10, 1880.—Ordered to be printed.

SMITHSONIAN INSTITUTION,
Washington, March 10, 1880.

GENTLEMEN: In behalf of the Board of Regents, I have the honor to submit to the Congress of the United States the annual report of the operations, expenditures, and condition of the Smithsonian Institution for the year 1879.

I have the honor to be, very respectfully, your obedient servant,

SPENCER F. BAIRD,
Secretary Smithsonian Institution.

Hon. WM. A. WHEELER,
President of the United States Senate, and

Hon. S. J. RANDALL,
Speaker of the House of Representatives.

THE SMITHSONIAN INSTITUTION.

RUTHERFORD B. HAYES, President of the United States, *ex officio* Presiding Officer.
MORRISON R. WAITE, Chief Justice of the United States, Chancellor of the Institution (President of the Board of Regents).
SPENCER F. BAIRD, Secretary (Director of the Smithsonian Institution and of the National Museum).
WILLIAM J. RHEES, Chief Clerk.

REGENTS OF THE INSTITUTION.

MORRISON R. WAITE, Chief Justice of the United States, *President of the Board.*
WILLIAM A. WHEELER, Vice-President of the United States.
HANNIBAL HAMLIN, member of the Senate of the United States.
NEWTON BOOTH, member of the Senate of the United States.
ROBERT E. WITHERS, member of the Senate of the United States.
HIESTER CLYMER, member of the House of Representatives.
JAMES A. GARFIELD, member of the House of Representatives.
JOSEPH E. JOHNSTON, member of the House of Representatives.
JOHN MACLEAN, citizen of New Jersey.
PETER PARKER, citizen of Washington, D. C.
ASA GRAY, citizen of Massachusetts.
HENRY COPPÉE, citizen of Pennsylvania.
WILLIAM T. SHERMAN, citizen of Washington, D. C.
NOAH PORTER, citizen of Connecticut.

EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS.

PETER PARKER. JOHN MACLEAN. WILLIAM T. SHERMAN.

MEMBERS EX OFFICIO OF THE INSTITUTION.

RUTHERFORD B. HAYES, President of the United States.
WILLIAM A. WHEELER, Vice-President of the United States.
MORRISON R. WAITE, Chief Justice of the United States.
WILLIAM M. EVARTS, Secretary of State.
JOHN SHERMAN, Secretary of the Treasury.
ALEX. RAMSEY, Secretary of War.
RICHARD W. THOMPSON, Secretary of the Navy.
DAVID M. KEY, Postmaster-General.
CARL SCHURZ, Secretary of the Interior.
CHARLES DEVENS, Attorney-General.
EDGAR M. MARBLE, Commissioner of Patents.

OFFICERS AND ASSISTANTS OF THE SMITHSONIAN INSTITUTION AND NATIONAL MUSEUM, JANUARY, 1880.

SMITHSONIAN INSTITUTION.

SPENCER F. BAIRD,
Secretary, Director of the Institution
WILLIAM J. RHEES, *Chief Clerk.*
DANIEL LEECH, *Corresponding Clerk.*

Assistants and Clerks.

CLARENCE B. YOUNG.
H. DIEBITSCH.
J. A. TURNER.
L. STOERZER.
HENRY GASS.
WM. B. TAYLOR.
G. H. BOEHMER.
M. E. GRIFFIN.
H. DE C. DAINGERFIELD.
S. G. BROWN.

NATIONAL MUSEUM.

G. BROWN GOODE, *Curator of the Museum.*
F. M. ENDLICH, *Assistant, Mineralogy.*
ROBT. RIDGWAY, *Assistant, Ornithology.*
TARLETON H. BEAN, *Assistant, Ichthyology.*
CHAS. RAU, *Assistant, Archæology.*
EDWARD FOREMAN, *Assistant, Ethnology.*
F. H. CUSHING, *Assistant, Ethnology.*
CHARLES A. WHITE, *Assistant Paleontology.*

HENRY HORAN, *Superintendent of Building.*
JOSEPH HERRON, *Janitor.*
W. J. GREEN, *Carpenter and Electrician.*
J. H. RICHARD, *Artist.*
A. Z. SHINDLER, *Artist.*
S. C. BROWN, *Clerk, Property and Records.*
E. P. UPHAM, *Clerk, Archæological Collections.*
JOSEPH PALMER, *Taxidermist.*
T. W. SMILLIE, *Photographer.*

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION FOR THE YEAR 1879.

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1. Annual report of the Secretary, giving an account of the operations and condition of the establishment for the year 1879, with the statistics of collections, exchanges, &c.

2. Report of the Executive Committee, exhibiting the financial affairs of the Institution, including a statement of the Smithson fund, the receipts and expenditures for the year 1879, and the estimates for 1880.

3. Proceedings of the Board of Regents for the session of January, 1880.

4. General appendix, consisting of scientific papers, original and selected, of interest to collaborators and correspondents of the Institution, teachers, and others engaged in the promotion of knowledge.

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REPORT OF PROFESSOR BAIRD,

SECRETARY OF THE SMITHSONIAN INSTITUTION, FOR 1879.

To the Board of Regents of the Smithsonian Institution ;

GENTLEMEN: I have the honor to present herewith the report of the operations and condition of the Smithsonian Institution for the year 1879:

THE SMITHSONIAN INSTITUTION.

INTRODUCTORY.

The year just passed has been marked by a number of interesting and important incidents in the history of the Institution, which will be detailed in their proper places; the most noteworthy being the memorial services, held in the United States Capitol, in honor of Professor Henry, and the commencement of work upon the new fire-proof building for the National Museum.

The usual routine of business has been prosecuted by the Institution during the year, the various departments receiving their share of attention and expenditure.

HENRY MEMORIAL SERVICES AND VOLUME.

In conformity with the action of the Board of Regents in reference to the holding of a public commemoration of Prof. Joseph Henry, a joint resolution of Congress was passed appointing January 16, 1879, as the time, and the Hall of the House of Representatives as the place, of such memorial services. These proceedings took place at the time announced, in the presence of a very large and distinguished auditory. Dr. Asa Gray was appointed by the Board of Regents to "prepare a sketch of the life, character, and public services of Professor Henry," which it was ordered should form part of the exercises at the Capitol.

The Vice-President of the United States, supported by the Speaker of the House, presided on the occasion. After prayer by the Rev. Dr. James McCosh, president of Princeton College, addresses were delivered by Hon. Hannibal Hamlin, Senator and Regent (the address being read by Vice-President W. A. Wheeler); Hon. R. E. Withers, Senator and Regent; Prof. Asa Gray, of Harvard University, Regent; after which Hon. Hiester Clymer, Member of the House and Regent, read the telegrams received on the occasion. The remaining addresses were delivered by Prof. William B. Rogers, of Boston; Hon. James A. Garfield, Member and Regent; Hon. S. S. Cox, Member, and formerly a

Regent, and by General William T. Sherman, a Regent. The exercises were concluded with prayer by the chaplain of the Senate, Rev. Dr. Byron Sunderland.

In addition to the Senators and Members of the House assembled, the President of the United States, members of the Cabinet, justices of the Supreme Court, and other dignitaries, were present; and the proceedings were solemn and impressive, as befitted the occasion.

By joint resolution of Congress, these memorial addresses were ordered to be printed in the "Congressional Record," which was accordingly done on the 4th of March following. The same resolution also directed the printing of fifteen thousand copies of the said proceedings in a "Memorial Volume," which volume should include also "such articles as may be furnished by the Board of Regents." A selection has accordingly been made by the special committee of the Regents appointed January 17, 1879 (consisting of Messrs. Gray, Parker, and Baird), embracing a few commemorative discourses delivered elsewhere, to form a concluding portion of the memorial volume. This material is now in the hands of the Public Printer, and it is hoped will soon be published.

Among other gratifying illustrations of the respect in which the memory of Professor Henry is held by the community, we may mention the efforts made to perpetuate it by means of works of art. Reference has been made in previous reports to the life-size portrait, painted, at the request of the Board of Regents, by Mr. Le Clear, of New York; and, also, to a similar portrait as to size and general character, by Mr. Henry Ulke, of Washington. A copy of the latter has been ordered by gentlemen in Philadelphia for the American Philosophical Society. A crayon portrait, also by Mr. Ulke, and considered an excellent likeness, has been furnished by him to Princeton College and other institutions.

Mr. Clark Mills, the well-known sculptor, has modeled a bust of Professor Henry partly from a cast taken after his death. A copy of this in plaster has been placed in the Smithsonian Institution.

Mr. C. V. Burton spent some time during the year at the Institution in modeling a small-sized bust, of which he has disposed a large number of copies.

A medallion likeness was made by Mr. Barber, the engraver of the Philadelphia mint, and a medal has been struck with this as the obverse side.

A likeness has also been engraved on steel at the Treasury Department, to accompany the Memorial Volume, an appropriation of five hundred dollars having been made by Congress for the purpose.

Another steel portrait has been engraved and published by the Messrs. Appleton, of New York, in their Annual Cyclopedia for the year 1878.

The Institution is also in possession of an oil painting of Professor Henry, painted from one or two sittings only, and presented by the artist, Mr. Ingalls. Excellent photographs have been taken of him by Gutekunst, of Philadelphia, and by Messrs. Smillie, Gardner, Brady, and Fassett, of Washington.

A statue of Professor Henry.—A few weeks ago (December 16, 1879) the Hon. Mr. Booth introduced in the Senate the following bill providing for a statue of Professor Henry in the grounds of the Smithsonian Institution:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the sum of twenty thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury of the United States not otherwise appropriated, for the purpose of erecting a statue of Joseph Henry on the grounds of the Smithsonian Institution.

SEC. 2. The money herein appropriated shall be expended under the direction of the Secretary of the Smithsonian Institution.*

APPOINTMENT AND ELECTION OF REGENTS.

By the terms of the act of Congress, the three members of the Board of Regents selected by the Speaker of the House to act in that capacity are appointed for a single Congress, or for two years; their term of service expiring on the fourth Wednesday of December, on which day, according to law, the appointment of new members is to be made.

These appointments were made by the Speaker on the 4th of April, 1879, by renewing the terms of service of Hon. Hiester Clymer, of Pennsylvania, and Hon. J. A. Garfield, of Ohio, and by appointing Hon. Joseph E. Johnston, of Virginia, in the place of Hon. Alexander H. Stephens, of Georgia. It is for the Board of Regents to say whether this apparent informality will in any way vitiate the appointments, and render it desirable that they be renewed at the present session.

The vacancy in the Senatorial Regents, caused by the expiration of the term of Hon. A. A. Sargent, was filled by the appointment, by the President of the Senate, on the 21st of March, of Hon. Newton Booth, of California.

The terms of four of the six citizens at large, namely, of Dr. John Maclean, of Princeton, Hon. Peter Parker, of Washington, Prof. Henry Coppée, of Pennsylvania, and Prof. Asa Gray, of Cambridge, having also expired, a joint resolution reappointing them, introduced in the Senate by Hon. Hannibal Hamlin, was passed, and approved by the President on the 17th of December.

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* It is gratifying to be able to state here that since the date of the above, a modification of this bill (introduced into the Senate by the Hon. Justin S. Morrill, of Vermont, and into the House of Representatives by the Hon. Hiester Clymer, of Pennsylvania) passed Congress unanimously and was signed by the President on the 1st of June, 1880. The act is entitled "AN ACT for the erection of a bronze statue of JOSEPH HENRY, late Secretary of the Smithsonian Institution," and is in the following terms: "*Be it enacted, &c.*, That the Regents of the Smithsonian Institution be, and are hereby authorized to contract with W. W. Story, sculptor, for a statue in bronze of JOSEPH HENRY, late Secretary of the Smithsonian Institution, to be erected upon the grounds of the said Institution; and for this purpose, and for the entire expense of the foundation and pedestal of the monument, the sum of $15,000 is hereby appropriated out of any moneys in the Treasury not otherwise appropriated."

In this connection I would also call the attention of the Board of Regents to the fact that the law of Congress, in establishing six years as the term of service of the six Regents elected as citizens at large, provides, at the same time, that two vacancies shall occur at the beginning of each new Congress and be filled by election. I am unable to say in what manner there happened to be four vacancies at a time; but in this, as in the case previously mentioned, it is for the Board of Regents to determine what action, if any, shall be taken in the premises.

MEETING OF THE ESTABLISHMENT.

The act of Congress organizing the Smithsonian Institution provides for an annual meeting of the establishment, although there is no special business to be prosecuted by that body, with the exception of a general inspection of the condition of the Institution. The meetings, although proposed by the Secretary, have, by the direction of the President, mostly been omitted. The following table shows the number of meetings held since the commencement of active operations by the Institution:

August 1, 1849.
May 3, 1853.
May 17, 1853.
June 6, 1853.
May 2, 1854.
June 6, 1854.
July 15, 1854.
June 4, 1873.
May 5, 1877.

The usual notice of a meeting on the 6th of May, 1879, was made to the President; but, in the absence of any special necessity, it was, by his authority, indefinitely postponed.

FINANCES.

In the report of the Executive Committee will be found a detailed statement of the finances of the Institution, which are believed to be in better condition than at any previous time, all arrearages having been paid and a larger balance than usual being on hand.

The following is a statement of the condition of the Smithsonian fund at the beginning of the year 1880:

The amount originally received as the bequest of James Smithson, of England, deposited in the Treasury of the United States, in accordance with the act of Congress of August 10, 1846	$515,169 00
The residuary legacy of Smithson, received in 1865, deposited in the Treasury of the United States, in accordance with the act of Congress of February 8, 1867	26,210 63
Total bequest of Smithson	541,379 63
Amount derived from savings of income and increase in value of investments, and deposited in the Treasury of the United States, as authorized by act of Congress of February 8, 1867	108,620 37
Amount of bequest of James Hamilton, of Carlisle, Pa., February 24, 1874	1,000 00

Total permanent Smithson fund in the Treasury of the United States, bearing interest at 6 per cent., payable semi-annually	$651,000 00
In addition to the above, there are Virginia bonds and certificates, viz, consolidated bonds, $58,700; deferred certificates, $29,375.07; fractional certificate, $50.13; total, $88,125.20, valued January, 1880, at	32,000 00
Cash balance deposited in the Treasury of the United States at the beginning of the year 1880, for current expenses	20,894 06
Total Smithson fund January 2, 1880	$703,894 06

The receipts in 1879, were $62,004.08, and the expenditures $41,110.02, leaving a balance on hand of $20,894.06.

THE HABEL BEQUEST.

Previous reports of the Institution contain allusions to the explorations and researches of Dr. Simeon Habel. This gentleman was of Austrian birth; graduated in 1846 at the Vienna University, and for several years had been the resident-physician in charge of a public hospital. In consequence of his liberal views, he was obliged to leave Europe and seek a home in America. His love of nature and the desire to advance science led him to undertake an extended tour through Central and South America. Before doing this, however, he spent several months at the Smithsonian Institution, in making himself familiar, under the direction of Professor Egleston, then in charge of the Geological Department, with the most important species of minerals and rocks. Subsequently, during seven years, he made collections in natural history and observations in meteorology, geography, geology, and archæology.

Among the regions of South America to which Dr. Habel devoted special attention were those of the guano deposits of Peru and of the remarkable group known as the Galapagos Islands. Of the peculiar bird fauna of these islands, Dr. Habel made large collections, which were fully described by Messrs. Sclater and Salvin in the proceedings of the Zoological Society of London.

Returning to New York about the year 1877, he devoted himself to the elaboration of his researches and, in time, prepared for the Institution, a memoir entitled "The Sculptures of Santa Lucia Cosumal whuapa, with an account of travels in Central America and on the Northwestern coast of South America." This work was published by the Institution in 1878, and contains a brief account of Dr. Habel's ethnological and archæological researches, and a minute description of a group of sculptures discovered by him at Santa Lucia Cosumalwhuapa, a small town in Guatemala. The variety of ornamentation, the skill in execution, and the grade of refinement exhibited in the designs upon these bas-reliefs, as well as the almost total absence of sculptures hitherto reported on the southern side of the Sierras, induced the Institution, on the recommendation of Profs. W. D. Whitney and J. H. Trumbull, to include Dr. Habel's paper among its publications.

The author was invited to visit Washington, where a room was provided for him at the Institution, and the drawings of these sculptures were reproduced by an artist, under his personal supervision. Dr. Habel highly appreciated the aid thus rendered him, and informed Professor Henry of his intention to leave a part of his estate to the Institution, to repay, at least in part, the cost of the publication of his memoir.

The Institution having learned of the death of Dr. Habel on the 1st of January, 1879, steps were taken to secure the legacy which he had promised as indicated in the following letter, deposited by him in the Emigrant Industrial Savings Bank, New York:

"DAVID LEDWITH, Esq.,
"*Comptroller of the Emigrant Industrial Savings Bank:*

"DEAR SIR: I have left with the Emigrant Industrial Savings Bank, for safe-keeping, three account-books in my name, with the order that the money deposited in the bank on each respective book should be paid after my death to the following persons and institution, namely:

"1. One thousand dollars of the account on book No. 122426 to Ernest Haeckel, of Jena, in Germany, and the *remainder of said account to the Smithsonian Institution at Washington.*

"2. All the amount in my favor on book No. 125437 should be paid to Stephen Pearl Andrews.

"3. The money in trust for Lizzie Fleischman on book No. 125436 should be paid to said person.

"Requesting the bank will comply with said order,

"I am, respectfully, yours,

"DR. HABEL."

Mr. Ledwith, the comptroller of the bank, on the 26th of February, 1879, presented a statement to the Institution of the amount to the credit of Dr. Habel on the account-book No. 122426, above referred to, showing a balance of $1,402.59. Of this $1,000 was paid to Professor Haeckel in accordance with the instructions of Dr. Habel, and the remainder, $402.59, paid to the secretary of the Smithsonian Institution.

It is proper to state that every facility was rendered by the officers of the bank in turning over to the Institution the bequest of Dr. Habel.

As it is the policy of the Institution to fund all moneys that may be received other than as income, I would suggest that the amount received from Dr. Habel be increased from the income of the Institution to $500, and that this sum be added to the Smithson fund as the Habel bequest. It will be remembered that, by a law of Congress, the Institution is authorized to increase its principal in the United States Treasury to a million dollars. In a somewhat similar case, that of Mr. James Hamilton, of Carlisle, Pa., the amount of $1,000 was deposited in the Treasury as the Hamilton fund.

RESEARCHES.

In the last report an account was given of an investigation of the ancient solar eclipses by Mr. Todd, of the Nautical Almanac Office. Among a number of eclipses added to the list then given are three observed in China in 709 B. C., 601 B. C., and 549 B. C., being the eclipses which have formed the subject of a paper by Schjellerup, of Copenhagen. During the past year the work of this investigation has consisted mainly in the collection of data and their preparation for discussion. As the research progresses, there seems reason for extending the scope of the research to include a large number of ancient ecliptic dates.

Apparatus for Testing Stone.—Many years ago a series of experiments were conducted at the Smithsonian Institution, under the direction of Professor Henry, in regard to the strength and durability of building materials, primarily for the purpose of determining what varieties of marble and other stones were best adapted for the construction of the extension of the United States Capitol. The apparatus used in these experiments has since been lying idle in the Smithsonian building, and as it occupied valuable space it has been returned to the arsenal, from which it was originally borrowed. It has there been put in order, and is now again in use by the Ordnance Bureau of the Army.

LABORATORY.

As stated in the last report, after a partial suspension of active operations in that direction, the laboratory of the Institution was put in order, and again made available for scientific research. This has always been an important feature in the operations of the Institution, and is one of those especially required by the act of Congress.

A thorough overhauling of the old instruments and equipment was made under the direction of Dr. Endlich, the chemist in charge, and all obsolete apparatus and unserviceable material was eliminated. The chemical and physical departments of the colleges in the District, such as the Columbian, Georgetown, and Howard University, were invited to select from this unserviceable matter what they could use for purposes of instruction, the remainder being suitably disposed of. The apartments were then altered to meet the requirements of the present day, and a sufficient amount of apparatus and equipment obtained to make a fairly efficient working establishment.

The work of the laboratory consists partly in determining the character of various minerals belonging to collections in the National Museum, and partly in carrying on researches asked for by the various departments of the government. No private work of this kind is undertaken by the Institution; but whenever a chemical investigation of any subject is required by the proper authorities it is carried out, if the time of the chemist will permit.

Under the first head, the identification of large numbers of specimens, previously undetermined, has been completed, the series placed in the mineralogical department, and the duplicates made up into sets for distribution to various educational establishments throughout the country, or to be held for exchange for other minerals. Further reference to this subject, however, will be found under the head of the National Museum.

Among the investigations carried on by the Institution for the benefit of the government may be mentioned the following:

An examination of the character and chemical composition of the Appolinaris water, at the request of the Secretary of the Treasury, a controversy having arisen between the custom-house authorities in New York and the importers of Appolinaris water, as to whether the article imported under that name really came unchanged from the springs or was artificially charged with other substances, especially carbonic acid. To solve this problem the services of several chemists were invoked, but these furnished contradictory results, and the Smithsonian Institution was therefore asked by the Treasury Department to give the subject proper attention, specimens of the water being duly supplied. This was among the most laborious researches ever intrusted to the Institution for prosecution, requiring the constant labor of the chemist for several weeks for its accomplishment. A report was finally made and transmitted to the Secretary.

Another investigation was as to the comparative percentages of carbon in different brands of steel, made at the request of Chief Engineer Shock, of the Bureau of Steam Engineering of the Navy Department.

In addition to the chemical work actually performed in its laboratory for the government, the Institution has also acted as adviser to the departments in securing specialists for investigations too extensive for the time and apparatus of its chemist, or which, for other reasons, could not be undertaken by him. Among these may be mentioned an examination of crude opium, for the amount of morphine it contained, made for the Treasury Department by Dr. Theodore G. Wormley, of the University of Pennsylvania, and by Dr. W. M. Mew, U. S. A., of Washington, &c.

The attention of the inspector of marine products for the city of Washington having been attracted by the occurrence of green oysters among those offered for sale, the health department, under Dr. Smith Townshend, requested of the Smithsonian Institution an investigation as to the cause of this color, the popular impression being that it was due to the presence of copper in the water, and denoted a poisonous condition of the oysters. Although this phenomenon is quite well known in Europe, and green oysters are considered in France an especial delicacy, the examination desired was made by Dr. Endlich with very perfect tests and without detecting any copper. In this connection it may be stated that recent investigations in Europe have shown that the green color is due to the presence of minute algæ on which the oyster feeds voraciously. In France the oysters are kept in pits along the seashore, where the highly-prized tinge is very soon acquired.

By a resolution of Congress the Secretary of the Institution was appointed a member of a commission to investigate the merits of signal apparatus to give warning of the accidental occurrence of fire, and during 1879 Mr. Watkins made experiments in the laboratory of the Institution to test his invention for this purpose.

In this connection it may be stated that the Secretary of the Institution has, by resolution of Congress, been appointed a member of the commission on improving the ventilation of the hall of the House of Representatives at the Capitol, and that he has attended the meetings of this commission and rendered it such service as his time and opportunity permitted him.

TELEGRAPHIC ANNOUNCEMENTS OF ASTRONOMICAL DISCOVERIES.

There are many astronomical discoveries, which, for the purpose of co-operative observation, require immediate announcement to observers in distant localities. Among such discoveries are those of planets and comets, or of bodies which are generally so faint as not to be seen except through the telescope, and which being in motion require that their place in the heavens be made known to the distant observer before they so far change their position as not to be readily found. For this purpose the ordinary mail conveyance requiring at least ten days, is too slow, since in that time the body will have so far changed its position as not to be found, except with great difficulty; and this change will become the greater if the body is a very faint one, for in that case it could only be discovered on a night free from moonlight, which of necessity, in ten or twelve days, must be followed by nights on which the sky is illuminated by the moon, and all attempts to discover the object would have to be postponed until the recurrence of a dark night. Indeed, even then the search would often prove in vain; and it would not be, in some cases, until after a set of approximate elements had been calculated and transmitted, that the astronomers on the two sides of the Atlantic would be able fully to co-operate with each other.

These difficulties were discussed by some of the principal astronomers of America and Europe, and an application was made to the Smithsonian Institution, through Dr. C. H. F. Peters, of Clinton, N. Y., to remove them by transmitting intelligence immediately through the Atlantic telegraph cable. For this purpose the Institution, in 1873, applied to the New York, Newfoundland and London Telegraph Company and to the Western Union Telegraph Company to be allowed free transmission of this kind of intelligence, and received through Cyrus W. Field, esq., and William Orton, esq., with that liberality which has always attended applications of a similar character by the Institution, the free use of all the lines of these companies for the object in question.

Similar privileges were granted in Europe for transmitting the intelligence between some of the principal centers of astronomical research in Europe and the eastern ends of the Atlantic cables.

The transmission of intelligence is not restricted to the discovery of planets and comets, but includes that of any remarkable solar phenomenon which may suddenly present itself in Europe, and of which observation in America may be practicable for several hours after the sun has set to the European observer; also the sudden outburst of a star like that in the "Crown" in 1866, together with unexpected showers of shooting stars, &c.

To carry out the proposition the following arrangements have been adopted, which are essentially those published in 1873, but with such additions and modifications as subsequent experience has proved necessary.

I.—*Center of communication in the United States.*

1. THE SMITHSONIAN INSTITUTION. Spencer F. Baird, director.

Centers of communication in Europe.

1. GREENWICH OBSERVATORY. Sir George B. Airy, astronomer-royal.
2. PARIS OBSERVATORY. Admiral Mouchez, director.
3. BERLIN OBSERVATORY. Prof. W. Foerster, director.
4. VIENNA OBSERVATORY, Academy of Sciences. Prof. Edmund Weiss, director.
5. PULKOVA OBSERVATORY. Ottò von Struve, director.

II.—Telegrams received at the Smithsonian Institution from observers in the United States will be forwarded immediately by Atlantic cable to Greenwich, Paris, Berlin, Vienna, and Pulkova, and thence by telegraph to other observatories in Europe.

III.—Discoveries made in Europe of new comets, planets, &c., will be announced without delay from Greenwich, Paris, Berlin, Vienna, and Pulkova, by Atlantic cable, to the Smithsonian Institution, and thence by telegraph to American observatories* and the Associated Press.

IV.—The telegraphic dispatch announcing a discovery should be as brief as possible, and, after conference with astronomers, the following form has been agreed upon:

After the single word "planet" (or "comet"), is given—

1. Its right ascension in time, hours, minutes, and seconds (the latter only to the nearest round tenth, *i. e.*, ten, twenty, thirty, forty, or fifty); next, separated by the word—

2. North or south, is given its—

3. Declination, to the nearest minute.

4. Then, in the case of a *planet*, the magnitude expressed by the nearest ordinal number.

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* The list of these observatories is at present as follows:

Shattuck Observatory	Hanover, N. H.
Observatory of Harvard College	Cambridge, Mass.
Yale College Observatory	New Haven, Conn.
Dudley Observatory	Albany, N. Y.
Litchfield Observatory	Clinton, N. Y.
Hobart College Observatory	Geneva, N. Y.
Red House Observatory	Phelps, N. Y.
Warner Observatory	Rochester, N. Y.
Allegheny Observatory	Allegheny, Pa.
Observatory of College of New Jersey	Princeton, N. J.
United States Naval Observatory	Washington, D. C.
Cincinnati Observatory	Cincinnati, Ohio.
Dearborn University Observatory	Chicago, Ill.
Ann Arbor Observatory	Ann Arbor, Mich.
University of State of Missouri	Columbia, Mo.
Morrison Observatory	Glasgow, Mo.
Observatory of Carleton College	Northfield, Minn.

In the case of a *comet*, the word *bright* or *faint* should be added.

5. Next, *the daily motion*, as near as the first observations allow it to be estimated.

For a *minor planet in opposition*, the motion in right ascension is approximately evident, and it is therefore sufficient to indicate the motion in declination, in minutes of arc, preceded by the word *north* or *south*.

For a *comet*, the direction of motion should be indicated by south, west, north, east, or by a combination of two of these words, which must be understood always (also below the pole) in reference to the equator, not in reference to the horizon. If the comet has a rapid motion, the number of degrees per day, as estimated, may follow.

6. Finally, the *date* of the position (having regard to Art. V) indicated by the day of the week.

The day of sending (civil reckoning, of course) is always written at the head of the dispatch by the telegraph operator (the United States law requires also the hour), and it may be presumed that the communications only exceptionally fail to reach the center stations (Art. I), even those on the other side of the Atlantic, on the same day. In order, however, to be independent of any delay of the operator, and agreeably to the wishes expressed by high astronomical authority, the date is now embodied in the dispatch by naming the *week* day, whereby at the same time all ambiguity is removed as to whether astronomical or civil date be meant.

7. Should it be deemed desirable to communicate the authority for the discovery, the shortest way would be to insert the name as the second word in the dispatch (after "planet" or "comet"). For example, the following dispatch, "Planet N. N. twenty-three thirty-five forty north twenty-one forty-six eleventh south three Wednesday," would be interpreted thus: A new planet is discovered by N. N. At midnight (see Art. V) between Wednesday and Thursday it will be in right ascension $23^h\ 35^m\ 40^s$, and declination $+21°\ 46'$; it is of the 11th magnitude, and has a daily motion of 3′ towards the south.

Or a dispatch like the following, "Comet N. N. twenty-two forty-three ten north sixty-five thirty-one bright southeast two Monday," would announce the discovery made by N. N. of a bright comet, that at midnight Monday—Tuesday will be in right ascension $22^h\ 43^m\ 10^s$ and declination $+65°\ 31'$, the declination decreasing, the right ascension increasing, moving daily about two degrees.

The preceding examples contain the greatest number of words (16) required for any dispatch, if composed according to the rules adopted above. Usually the number will be less. Sometimes, however, the dispatch thus composed would become equivocal, and it has, therefore, been established as an additional rule that the number expressing the minutes of right ascension or declination shall always be expressed in words, even when *zero* occurs. Therefore $23^h\ 0^m\ 40^s$ should be written "twenty three nought forty," while "twenty three forty" will be understood to mean $20^h\ 3^m\ 40^s$. Again, "north thirty six" would be $+30°$ $6'$, but "north thirty six nought" is $+36°\ 0'$. In a similar way 0^h of right ascension, or 0^s of declination are to be distinctly expressed by the word "nought." Only for the seconds of right ascension when they are zero, that word for brevity's sake is omitted as unnecessary.

V.—The right ascension and declination in the dispatch will be understood to give the position (by proper motion approximately reduced) for THE MIDNIGHT FOLLOWING the date of the dispatch: Washington time for American discoveries; Greenwich time for European.

Usually the discoverer himself has more complete data on hand than others for bringing the position up in advance, and for this reason the *following* midnight is given preference to any preceding time, as, for example, that of the discovery.

VI.—Since in conformity with the preceding article, only an approximate estimate of a later position, and not that of the first observation itself, is given, the dispatch is not to be considered as a document for deciding the question of priority of discovery.

On the other hand, it is expected that observers, in communicating their discoveries, will adhere to the form of the programme explained in the foregoing articles, and thus save much time and labor to those that wish to co-operate.

List of minor planets discovered in the year 1879.

No.	Name.	Date.		Discoverer.	Discoverer's No.	Observatory.
192	Nausikaa	February	17	Palisa	15th	Pola.
193	Ambrosia	February	28	Coggia	3d	Marseilles.
194	Procne	March	21	Peters	33d	Clinton.
195	Eurycleia	April	19	Palisa	16th	Pola.
196	Philomela	May	14	Peters	34th	Clinton.
197	Arete	May	21	Palisa	17th	Pola.
198	Ampella	June	13	Borrelly	11th	Marseilles.
199	Byblis	July	9	Peters	35th	Clinton.
200	Dynamene	July	27	Peters	36th	Clinton.
201	Penelope	August	7	Palisa	18th	Pola.
202	Chryseis	September	1	Peters	37th	Clinton.
203	Pompeia	September	25	Peters	38th	Clinton.
204	Callisto	October	8	Palisa	19th	Pola.
205		October	13	Palisa	20th	Pola.
206	Hersilia	October	13	Peters	39th	Clinton.
207		October	17	Palisa	21st	Pola.
208		October	21	Palisa	22d	Pola.
209	Dido	October	22	Peters	40th	Clinton.
210		November	12	Palisa	23d	Pola.
211		December	10	Palisa	24th	Pola.

LIST OF COMETS DISCOVERED IN 1879.

A	Brorson's Comet. Periodic	February	26			Windsor, N. S. W.
B	Comet 1867. II. Periodic	April	24	Tempel		Florence.
C	1879. III	June	15	Lewis Swift		Rochester, N. Y.
E	1879. IV	August	24	Hartwig		
D	1879. V	August	21	Palisa		Pola.

PUBLICATIONS.

The publications of the Institution consist of three classes: The first, the "Smithsonian Contributions to Knowledge"; the second, the "Smithsonian Miscellaneous Collections"; and the third, the "Annual Reports of the Regents" of the Institution. The works of the first class, the Smithsonian Contributions to Knowledge, are published in quarto form, and are intended to embrace original memoirs, either the result of special investigations authorized and directed by the Institution, or prosecuted under other auspices and presented to it. The works of the second class, the Miscellaneous Collections, are similar in plan and construction to the "Contributions," but are in octavo form, and embrace more particularly monographic and descriptive papers in natural history, formal or systematic lists of species of animals or plants, physical tables, reports on the present state of knowledge in some department of physical or biologic science, &c. As with the "Contributions," each volume is composed of several distinct and independent papers, having no necessary connection with each other, the combination being determined chiefly by the aggregate number of pages suitable for a volume of average size. The average number of pages in the quarto volume is about 600; in the octavo volume, about 800. Each paper or memoir in either class is separately paged and indexed, with its own title-page, so as to be complete in itself, and separately distributed according to its subject. Of the quarto "Contributions," twenty-one volumes, and of the octavo "Collections," fifteen volumes have been published.

The Smithsonian annual reports, commenced in 1847, being made to Congress, are published by that authority, and not at the expense of the Smithson fund. The earlier reports of the Secretary were printed in small pamphlet editions, but were collected and reprinted with the report for 1853, and with this the series of bound volumes may be said to have begun. The number, or edition, ordered by Congress has varied from year to year, but the proportion of copies placed at the disposal of the Institution has been distributed to its correspondents as fully and liberally as possible.

Smithsonian Contributions to Knowledge.—The Institution has now enough material ready for two volumes of the quarto series of Contributions, the twenty-second volume of which will be issued early in the year 1880, and will consist of the following memoirs:

1. Antiquities in Tennessee. Joseph Jones.
2. Sculptures of Santa Lucia. S. Habel.
3. Archæological Collections of the National Museum. Charles Rau.
4. The Palenque Tablet. Charles Rau.
5. Remains of Man in the Aleutian Islands. W. H. Dall.

These papers have all been described in previous reports with the exception of the one on the Palenque tablet, by Charles Rau. This publication relates to a stone tablet covered with glyphic designs which was formerly in the possession of the National Institute for the Promotion of Science (established at Washington about forty years ago) and became afterward the property of the Smithsonian Institution. The records state that the fragments constituting this tablet were presented to the National Institute by Mr. Charles Russell, consul of the United States at Laguna, island of Carmen, Mexico. They had been obtained at Palenque in a manner not explained, and arrived in Washington in 1842, and were deposited in the Patent Office with the collections of the National Institute. The transfer of these collections to the Smithsonian Institution took place in 1858.

The archæological importance of this tablet was first pointed out in 1863 by Dr. George A. Matile. While engaged in making a cast of it, at the request of the late Professor Henry, he recognized it as one of the three stone slabs which, placed together, bore on their surface the sculpture of the famous group of the cross, forming the chief ornament of one of the temples at Palenque. The earliest explorers of the ancient city, Del Rio and Dupaix, still saw the Smithsonian tablet in its proper place in the "Temple of the Cross," and figured it, though in a very defective manner, as a part of the group; but it probably was already broken in 1832, when Waldeck explored the ruins of Palenque. Stephens, who was there eight years afterward, noticed its scattered pieces. As a consequence, neither of the last-named explorers has left a representation of this valuable complement of the celebrated sculpture.

Impressed with the importance of the subject, the author undertook to prepare this monograph, which is not merely confined to a description of the tablet but embraces also a number of cognate topics. Of the two accompanying plates, which were specially executed for the work, one represents the Smithsonian tablet in juxtaposition with Catherwood's well-known delineation of the Tablet of the Cross in Volume II of Stephens's "Incidents of Travel in Central America, Chiapas, and Yucatan"; the other is an artotype showing the Smithsonian tablet as it appears after its restoration. Most of the illustrations in the text were kindly lent by Mr. H. H. Bancroft, of San Francisco; the others were expressly engraved for the publication.

The work comprises five chapters, to which an appendix is added.

In the first chapter the author gives the history of the Smithsonian tablet as far as he could trace it by an examination of the existing records. The second chapter treats in chronological order of the expeditions undertaken for the purpose of exploring the ruins of Palenque, and of the works and minor publications resulting from these explorations. It is a curious circumstance that the existence of the ancient city remained unknown until the second half of the eighteenth century, when accident led to the discovery of these remarkable ruins, hidden for centuries in the shadows of a Guatemalan forest. Cortez, on his famous expedition to Honduras (in 1524), doubtless passed at no great distance from the locality now called Palenque, and if it had been an inhabited city at that time the daring conquistador probably would have turned aside from his march for the purpose of conquering and plundering it. Moreover, no mention of the city is made in the Spanish records of that period, and it may be assumed that it was deserted and in a ruinous condition at the time of the conquest.

The principal explorations of Palenque were undertaken by Del Rio, Dupaix, Waldeck, and Stephens, between the years 1787 and 1839, thus extending over a period of more than half a century; but while the reports of the three first named explorers remained unpublished for many years, Mr. Stephens's account appeared in print within a year or two after his visit to the ruins, which thus became known to a large body of readers, both in this country and abroad.

In the third chapter the author describes, according to the accounts of the different explorers, the Temple of the Cross and the celebrated bas-relief from which it derives its name. These accounts, though not absolutely harmonious, coincide in the main points and give a pretty good idea of the edifice and its appurtenances.

The fourth chapter is devoted to a consideration of the Group of the Cross, including the Smithsonian tablet. It will be seen that the earlier representations of this interesting piece of ancient American sculpture are incorrect and fanciful, more particularly with regard to the design and arrangements of the glyphs surrounding the cross, and the human figures standing at its sides. In speaking of the significance of the bas-relief, the author combats the theory that the adoration of the cross among the aborigines of certain parts of America was due to the influence of Christian missionaries, said to have gone to the New World long before its discovery in the fifteenth century. He adduces facts showing that the cross had a symbolic meaning in America in times long antedating the Columbian era.

The fifth chapter treats of aboriginal writing in Mexico, Yucatan, and Central America. The Mexicans, it is well known, had already made some steps toward phonetization, being able, as Humboldt says, "to write names by writing some signs which recalled sounds." The Yucatecs and Central Americans, however, used signs of a different character, denominated *calculiform* by M. Aubin, the distinguished French savant. The question of their significance has been revived of late years by Brasseur de Bourbourg's discovery and publication of Bishop Landa's manuscript of the sixteenth century, which had lain for many years unnoticed in the archives of the Royal Academy of History at Madrid. The celebrity of the bishop's work is chiefly due to the circumstance that it contains delineations of what he calls the alphabetic signs of the Yucatecs. The discovery of this supposed key was hailed with great enthusiasm by scholars interested in the decipherment of the glyphs sculptured on the walls of ancient edifices in Central America and Yucatan, and of the few manuscripts in similar characters which have escaped the destructive fanaticism of Spanish priests, namely, the Dresden Codex, the Codex Peresianus and the Codex Troano, yet the results have thus far not justified the high expectations at first entertained.

The author endeavors to show, by an analytical process, the affinity between Bishop Landa's characters and the glyphs on the Palenquean tablets, to which he consequently ascribes a Maya origin. He thinks it probable that the Yucatecs employed in their writing certain characters as equivalents for sounds, perhaps syllabic and at the same time, possibly to a great extent, conventional figures imparting a definite meaning. On the other hand, he strongly doubts whether the Mayas and kindred tribes ever went so far as to express the elementary signs of their speech by corresponding signs; in short, whether they possessed a written language in the modern sense. He hardly believes that the meaning of Central American and Yucatec glyphs will ever be revealed through Landa's key, which, if it really was what the bishop claims, would apply to the Maya as spoken at the time of the conquest, but, owing to the mutability of languages, not to the earlier kindred vernacular of the builders of Palenque and other now ruined cities of the same regions.

The appendix relates to the ruins of Yucatan and Central America and forms a complement to the chief topics of the publication.

The twenty-third volume of Contributions will probably contain:

1. Lucernariæ. H. J. Clark.
2. Geology of Louisiana. E. W. Hilgard.
3. Internal Structure of the Earth. J. G. Barnard.
4. Monograph of the Trochilidæ. D. G. Elliot.
5. Fever, a Study in Morbid and Normal Physiology. H. C. Wood, jr.

Miscellaneous Collections.—Several volumes of Miscellaneous Collections will be published in a few months, the articles composing them having already been printed and stereotyped.

Volume XVI of this series will contain:

1. Monograph of Strepomatidæ. G. W. Tryon.
2. Catalogue of Diptera. R. Osten-Sacken.
3. Toner lecture: Nature of Reparatory Inflammation in Arteries after Ligature. E. O. Shakespeare.
4. Circular relative to Smithsonian Literary and Scientific Exchanges.
5. Circular relative to Business Arrangements of the Smithsonian Institution.
6. List of Humming Birds. D. G. Elliot.
7. List of the Principal Libraries in the United States.
8. Check-list of Smithsonian Publications to July, 1879.

Volume XVII of the Miscellaneous Collections will consist of—

1. Documents relative to the Origin and History of the Smithsonian Institution. W. J. Rhees.

Volume XVIII of the Miscellaneous Collections will be composed of—

1. The Scientific Writings of James Smithson.
2. An Account of James Smithson and his Bequest. W. J. Rhees.
3. Journals of the Board of Regents, reports of committees, statistics, &c., from 1846 to 1877.

Volume XIX of Miscellaneous Collections will consist of—

1. Proceedings of the National Museum for 1878.
2. Proceedings of the National Museum for 1879.

Writings of James Smithson.—The scientific writings of James Smithson, the distinguished founder of the Smithsonian Institution, have been collected and are published in accordance with the instructions of the Board of Regents. These memoirs were originally contributed to the "Transactions of the Royal Society of London," of which Smithson was a member between the years 1791 and 1817, and to Thomson's "Annals of Philosophy," between 1819 and 1825. They are twenty-seven in number and embrace a wide range of subjects, from the origin of the earth, the nature of the colors of vegetables and insects, the analyses of minerals and chemicals, to an improved method of constructing lamps, and of making coffee. Some of these papers were translated into French by the author and others, and published in the "*Journal de Physique, de Chimie, et d'Histoire Naturelle.*" They prove conclusively the scientific character of Smithson and his title to distinction as a contributor to knowledge.

Among the personal effects of the founder of the Institution were several hundred manuscripts, besides a large collection of scraps and notes on a great diversity of subjects, including history, the arts, language, rural economy, construction of buildings, &c., which, unfortunately, were destroyed by the fire in the Smithsonian building in 1865. It is probable that Smithson also contributed articles to scientific and literary journals other than those mentioned, but none have been found, though the leading English periodicals of the day have been carefully examined.

Appended to the writings of Smithson are reviews of their scientific character, by Prof. Walter R. Johnson, communicated to the National Institute of Washington in 1844, and by J. R. McD. Irby prepared for the Institution in September, 1878. The material for this work has been collected and the volume edited by Wm. J. Rhees, chief clerk of the Institution.

History of the Institution.—The work mentioned in the last report relative to the origin and history of the Institution, as ordered by the Board of Regents, has been completed under the efficient editorship of

Mr. William J. Rhees, chief clerk of the Institution, and has been published. This history forms an octavo volume of 1,027 pages. It contains the will of Smithson, a republication of all the debates and legislation of Congress relative to the bequest, the correspondence and official papers of Mr. Rush, the agent of the United States in procuring the legacy, the history of the investment of the fund, the opinions of learned men as to the best disposition of the bequest, and many other documents of value in connection with the history of the establishment. The work has a full index.

Journals of the Board of Regents.—Another volume of the history of the Institution has been compiled by Mr. Rhees, containing the journal of proceedings of the Board of Regents from its first meeting, September 12, 1846, to January 26, 1876, together with the reports of the executive, building, and special committees for the same period. The eulogies on deceased members of the Board and distinguished collaborators of the Institution are given, and also a full account of the Bache scientific fund, the Tyndall trust, Corcoran Gallery of Art, Toner lectures, Hamilton bequest, the report of the committee of the board on the invention of the electro-magnetic telegraph, the report of the examination of Professor Henry by the English scientific commission, statistical tables, and valuable information relative to the history and operations of the Institution.

Toner lectures.—The seventh Toner lecture has been published by the Institution, and is a concise and interesting presentation of "The nature of reparatory inflammation in arteries after ligature, compressure and torsion," by Dr. Edward O. Shakespeare, of Philadelphia, delivered in Washington, June 27, 1878. The bleeding of wounds afresh has formed a favorite theme of study from time immemorial; its nature and the most efficient means for its arrest have drawn to it the attention of physicians in all ages. Dr. Shakespeare gives an epitome of the successive efforts made by skilled hands to stay the subsequent bleeding of wounds and amputations, from the first recorded authority, Jean Louis Petit, in 1731–'32, to date; this valuable summary is followed by one of the prevalent opinions in regard to the question, and he then sketches, in minute, succinct detail, his own personal observations. This concluding chapter is illustrated by four carefully prepared plates.

Monograph of Chitonidæ.—Reference has been made in previous reports to a monograph of the *Chitonidæ* prepared by Dr. Philip P. Carpenter, of Montreal, with a view to publication by the Institution.

At Dr. Carpenter's death, this manuscript, in a still unfinished condition, was discovered to consist largely of notes and memoranda, written in a peculiar and antiquated short-hand, with which no one in this country was familiar. The skeleton of classification was almost completed, but the details in regard to particular species were often deficient or existed only in the form of these short-hand notes. As the usefulness of the work and especially its completeness depended largely on the comprehension of these notes, search was made, for a long time unsuccessfully, for some one able to decipher them. At last an old classmate and personal friend of Dr. Carpenter, Mr. R. D. Darbishire, of Manchester, England, undertook the task, with the assistance of the Rev. W. H. Herford. To the knowledge of the short-hand possessed by Mr. Darbishire (one of the few living persons who can read it) and to his generous willingness to devote his time to the wearisome duty for the benefit of science and out of regard for Dr. Carpenter's memory we are very greatly indebted and owe the translation of the above-mentioned notes. Mr. Darbishire declined any remuneration for his services, and the labor bestowed by Mr. Herford was quite beyond the value of any honorarium which the Institution was able to make him. The thanks of the Institution and of men of science generally are therefore due to these gentlemen. The illustrations for the monograph, which are quite numerous, are yet to be engraved, though they have already been beautifully drawn by Mr. Emerton, under Dr. Carpenter's direction, at the cost of the Institution. This and a not inconsiderable amount of editing, which has been intrusted to Mr. W. H. Dall, remain to be accomplished before the monograph will be ready for publication, a task which cannot be wholly completed under a year or two.

List of zoological genera.—Among the works offered to the Smithsonian Institution for publication is a list of the zoological genera, giving the time of publication and the class of the animal kingdom referred to. Such works, if properly executed, are of great value to the investigator, since, although imposing an immense labor upon the compiler, they enable the student to at once determine points of synonymy and priority of date; also whether a name proposed for a new genus has already been used, thus sparing an enormous aggregate of individual effort. This work, by Mr. Samuel H. Scudder, of Cambridge, will probably be completed and published in the course of the year 1880.

Bulletins of the National Museum.—In the Secretary's Report for 1875 it was stated that another series of publications, which would form a part of the Miscellaneous Collections, had been commenced under the above title. This series is intended to illustrate the collections of natural history and ethnology belonging to the United States, and constituting the stock of the National Museum, of which the Smithsonian Institution is the custodian. These bulletins, prepared at the request and mainly by the attachés of the Institution, have been printed under the authority of the Secretary of the Interior. They form an independent series, which has proved very acceptable to naturalists, as enabling them to obtain prompt information as to the additions to and the components of the National Museum.

The following is a list of the titles and contents of the bulletins already published:

Bulletin 1.—Check-List of North American Batrachia and Reptilia; with a Systematic List of the higher groups, and an essay on geographical distribution based on the specimens contained in the United States National Museum. By Edward D. Cope. 1875. 8vo., 104 pp.

Bulletin 2.—Contributions to the Natural History of Kerguelen Island, made in connection with the American Transit of Venus Expedition, 1874–'75. By J. H. Kidder, M. D., Passed Assistant Surgeon, United States Navy. I. Ornithology. Edited by Dr. Elliott Coues, United States Army. 1876. 8vo., 51 pp.

Bulletin 3.—Contributions to the Natural History of Kerguelen Island, made in connection with the American Transit of Venus Expedition, 1874–'75. By J. H. Kidder, M. D., Passed Assistant Surgeon, United States Navy. II. 1876. 8vo., 122 pp. The contents are as follows:

- Oology.—By J. H. Kidder and Elliott Coues.
- Botany:
  - A. Phænogamia, Filices, et Lycopodiaceæ. Revised by Asa Gray.
  - B. Musci. By Thomas P. James.
  - C. Lichenes. By Edward Tuckerman.
  - Algæ. By W. G. Farlow.
  - Crozet Flora:
- Geology. By F. M. Endlich.
- Mammals. By J. H. Kidder.
- Fish. By Theodore N. Gill.
- Mollusks. By W. H. Dall.
- Insects:
  - Diptera. By C. R. Osten-Sacken.
  - Pseudo-Neuroptera. By H. A. Hagen.
  - Crustaceans. By S. I. Smith.
  - Annelids, Echinoderms, and Anthozoa. By A. E. Verrill.
  - Surgeon E. Kershner's Collection.
- A Study of Chionis Minor. By J. H. Kidder and Elliott Coues.

Bulletin 4.—Birds of Southwestern Mexico. Collected by Francis E. Sumichrast for the United States National Museum. Prepared by George N. Lawrence. 1875. 8vo., 56 pp.

Bulletin 5.—Catalogue of the Fishes of the Bermudas. Based chiefly upon the collections of the United States National Museum. By G. Brown Goode, M. A., Curator United States National Museum. 1876. 8vo., 82 pp.

Bulletin 6.—Classification of the Collection to illustrate the animal resources of the United States. A list of the substances derived from the animal kingdom, with synopsis of the useful and injurious animals, and a Classification of the methods of capture and utilization. By G. Brown Goode. 1876. 8vo., 126 pp.

Bulletin 7.—Contributions to the Natural History of the Hawaiian and Fanning Islands and Lower California, made in connection with the United States North Pacific Surveying Expedition, 1873–'75. By Thomas H. Streets, M. D., Passed Assistant Surgeon, United States Navy. 1877. 8vo., 172 pp. The subjects treated of are:

- Ornithology.
- Herpetology.
- Ichthyology:
  - I. Fishes of Upper and Lower California.
  - II. Fishes of the Hawaiian Islands.
  - III. Fishes of the Fanning Islands.
  - IV. Fishes of the Samoan Islands.
- Crustacea.
- Botany.

Bulletin 8.—Index to the Names which have been applied to the Subdivisions of the Class Brachiopoda, excluding the *Rudistes*, previous to the year 1877. By W. H. Dall, United States Coast Survey. 1877. 8vo., 88 pp.

Bulletin 9.—Contributions to North American Ichthyology, based primarily on the Collections of the United National Museum. I. Review of Rafinesque's Memoirs on North American Fishes. By David S. Jordan. 1877. 8vo., 53 pp.

Bulletin 10.—Contributions to North American Ichthyology, based primarily on the Collections of the United States National Museum. II. A.—Notes on *Cottidæ*, *Etheostomiatidæ*, *Percidæ*, *Centrarchidæ*, *Aphredoderidæ*, *Dorosomatidæ*, and *Cyprinidæ*, with Revisions of the Genera and Descriptions of New or Little Known Species. B.—Synopsis of the *Siluridæ* of the Fresh Waters of North America. By David S. Jordan. 1877. 8vo., 120 pp.

Bulletin 11.—Bibliography of the Fishes of the Pacific United States. By Theodore N. Gill. (In Press.)

Bulletin 12.—Contributions to North American Ichthyology. III. A.—On the Distribution of the Fishes of the Alleghany Region of South Carolina, Georgia, and Tennessee, with Descriptions of new or little known species. By David S. Jordan and Alembert W. Brayton. B.—A Synopsis of the Family *Catostomidæ*. By David S. Jordan. 1878. 8vo., 237 pp.

Bulletin 13.—Flora of St. Croix and the Virgin Islands. By Baron H. F. A. Eggers. 1879. 8vo., 139 pp.

Bulletin 14.—Catalogue of Collection illustrating the animal resources and the Fisheries of the United States. Prepared under the direction of G. Brown Goode. 1879. 8vo., 351 pp.

Bulletin 15.—Contributions to the Natural History of Arctic America, made in connection with the Howgate Polar Expedition, 1877–'78. By Ludwig Kumlien, Naturalist of the Expedition. 1879. 8vo., 179 pp.

ETHNOLOGY, MAMMALS, AND BIRDS. By Ludwig Kumlien.
FISHES. By Tarleton H. Bean.
ANNELIDES, MOLLUSCOIDS, AND RADIATES. By A. E. Verrill.
MOLLUSKS. By W. H. Dall.
INSECTS:
  Diurnal Lepidoptera. By W. H. Edwards.
INSECTS:
  Hymenoptera, Nocturnal Lepidoptera, Diptera, Coleoptera, Neuroptera, and Arachnida. By S. H. Scudder and others.
PLANTS. By Asa Gray.
LICHENS. By Edward Tuckerman.
ALGÆ. By W. G. Farlow.

Bulletin 16.—Synopsis of the Fishes of the United States. By David S. Jordan. (In Press.)

The fifteenth number of the Bulletin of the National Museum is wholly made up of the interesting and novel notes of Mr. Ludwig Kumlien, who, under the auspices of the Smithsonian Institution, in 1877–'78, accompanied the Howgate polar expedition as naturalist. He passed the long arctic winter of 1877–'78 in the little harbor of Annanactook, Cumberland Gulf, latitude 67° north, longitude 68° 50′ west. This sound, gulf, or inlet of Cumberland extends from about latitude 65° north to latitude

67°+ north. It is the "Cumberland Straits" of Baffin, who was its original discoverer at the end of the sixteenth century; again rediscovered by Captain Penny in 1839, who named it Hogarth Sound; and still again it was visited by Captain Wareham in 1841, who, unconscious of his predecessors, named it once more anew as Northumberland Inlet. It has become latterly a frequented place of resort for Scotch and American whalemen, whose ships frequently winter on the southwest shores of its boundaries.

Here Mr. Kumlien passed seven or eight months in close intercourse with the Eskimo, and neglected no opportunity for study of this people. His detailed account of the curious habits and mental characteristics of the Innuit is one of the most complete and finished descriptions ever given of them; clear, succinct, and comprehensive, it is a valuable ethnological pen picture.

Mr. Kumlien paid attention to the various subdivisions of natural history, and made as full notes as possible, under the circumstances, upon the mammals, birds, and fishes of the region. His limited means for action, his scant accommodations on the little schooner, and the forced, hasty departure from winter quarters gave no opportunity for exhaustive collections of any kind whatever; but the insects, the plants, the mollusks, and the algæ secured have been carefully examined by experts in these branches, and reported on in this bulletin, thus rendering it a most valuable contribution to our knowledge of circumpolar life.

Proceedings of the National Museum.—It had frequently been suggested as desirable that the National Museum should have some medium of prompt publication for announcing descriptions of specimens received (many of which are new species), as well as presenting other interesting facts relative to natural history, &c., as furnished by the correspondents of the institution. The publication of the "Proceedings of the National Museum" was accordingly commenced, the work comprising short descriptions of the additions to the museum, accounts of new species, faunal, and other lists, &c. It is printed in successive signatures, as fast as copy sufficient for sixteen pages is prepared, each signature having printed at the bottom of its first page the date of actual issue, for deciding questions as to priority of publication. It is at once distributed to scientific societies and leading naturalists in this country and in Europe. The list of important articles of greater or less length already printed, and forming the volume for 1878, is as follows:

By Tarleton H. Bean. Description of a new sparoid fish from Savannah bank; on the occurrence of *Stichæus punctatus*, at Saint Michaels, Alaska; on the identity of *Euchalarodus putnami*, Gill, with *Pleuronectes glaber* (Storer) Gill, with notes on the habits of the species; description of a species of *Lycodes* from Alaska, believed to be undescribed.

By L. Belding. A partial list ot the birds of Central California.

By Caleb Cook. The manufacture of porpoise oil.

By W. H. Dall. Descriptions of new forms of mollusks from Alaska, contained in the collections of the National Museum; Post-pliocene fossils in the coast range of California; fossil mollusks from later Tertiaries of California; note on shells from Costa Rica, Kitchenmidden, collected by Drs. Flint and Bransford; distribution of Californian Tertiary fossils; descriptions of new species of shells from California in the collections of the National Museum; report on the limpets and chitons of the Alaskan and Arctic region, with descriptions of genera and species believed to be new.

By Vinal N. Edwards. On the occurrence of the oceanic bonito in Vineyard Sound, Massachusetts.

By Theodore Gill. Synopsis of the pediculate fishes of the eastern coast of extratropical North America; note on the *Antennariidæ;* on the proper specific name of the common pelagic antennariid *Pterophryne;* note on the *Ceratiidæ;* note on the *Maltheidæ.*

By G. Brown Goode. The *Clupea tyrannus* of Latrobe. The occurrence of *Belone latimanus* in Buzzard's Bay, Massachusetts; the voices of crustaceans; a revision of the American species of the genus *Brevoortia*, with a description of a new species from the Gulf of Mexico; the occurrence of *Hippocampus antiquorum* or an allied form on Saint George's banks; the occurrence of the Canada porcupine in West Virginia; on two fishes from the Bermudas, mistakenly described as new by Dr. Günther.

By G. Brown Goode and Tarleton H. Bean. The Craig flounder of Europe on the coast of North America; the oceanic bonito on the coast of the United States; description of *Caulolatilus microps*, a new species of fish from the gulf coast of Florida; on a new serranoid fish from the Bermudas and Florida; descriptions of two new species of fishes from the coast of Florida; a note upon the black grouper of the southern coast; descriptions of two gadoid fishes from the deep-sea fauna of the Northwestern Atlantic; description of *Argentina syrtensium*, a new deep-sea fish from Sable Island bank; the identity of *Rhinonemus caudacuta*, Gill, with *Gadus cimbrius*, Linn.; note on *Platessa ferruginea*, D. H. Storer, and *Platessa rostrata*, H. R. Storer; on the identity of *Brosmius americanus*, Gill, with *Brosmius brosme*, White.

By J. B. S. Jackson. Arsenic acid for protecting anatomical preparations from insects.

By Lieut. J. P. Jefferson. On the mortality of fishes in the Gulf of Mexico in 1878.

By Lieut. J. P. Jefferson, Dr. Joseph Y. Porter, and Thomas Moore On the destruction of fish in the vicinity of the Tortugas during the months of September and October, 1878.

By David S. Jordan. Notes on a collection of fishes from Clackamas River, Oregon.

By David S. Jordan and Charles H. Gilbert. Notes on the fishes of Beaufort Harbor, North Carolina.

By George N. Lawrence. Catalogue of the birds of Dominica, from collections made for the Smithsonian Institution by Frederick A. Ober, together with his notes and observations; catalogue of the birds of St. Vincent, from collections made by Mr. Fred. A. Ober, under the directions of the Smithsonian Institution, with his notes thereon; catalogue of the birds of Antigua and Barbuda, from collections made for the Smithsonian Institution by Mr. Fred. A. Ober, with his observations; catalogue of the birds of Grenada, from a collection made by Mr. Fred. A. Ober for the Smithsonian Institution, including others seen by him, but not obtained; catalogue of the birds collected in Martinique by Mr. Fred. A. Ober for the Smithsonian Institution; catalogue of a collection of birds obtained in Guadeloupe for the Smithsonian Institution by Mr. Fred. A. Ober; a general catalogue of the birds noted from the islands of the Lesser Antilles, visited by Mr. Fred. A. Ober, with a table showing their distribution and those found in the United States.

By Prof. N. T. Lupton. On the breeding habits of the sea catfish.

By Dr. James C. Merrill. Notes on the ornithology of Southern Texas, being a list of birds observed in the vicinity of Fort Brown, Tex., from February, 1876, to June, 1878.

By Felipe Poey. Notes on the American species of the genus *Cybium*.

By Captain R. H. Pratt. Catalogue of casts taken by Clark Mills, esq., of the heads of sixty-four Indian prisoners, of various Western tribes and held at Fort Marion, Saint Augustine, Fla., in charge of Capt. R. H. Pratt.

By Robert Ridgway. On a new humming-bird (*Atthis ellioti*) from Guatemala; a review of the American species of the genus *Scops* Savigny; descriptions of several new species and geographical races of birds contained in the collection of the United States National Museum; description of two new species of birds from Costa Rica, and notes on other rare species from that country; descriptions of new species and races of American birds, including a synopsis of the genus *Tyrannus*.

By Silas Stearns. A note on the gulf menhaden.

By Dr. Franz Steindachner. Note on *Perca flavescens*.

By Samuel Wilmot. Notes on the Western gizzard shad.

The above collection constitutes Vol. I of the *Proceedings of the United States National Museum*, comprising 524 pages, octavo, and embellished with 8 plates and 10 wood-cuts.

Chief among these interesting papers is the digest of Mr. F. A. Ober's researches in the Lesser Antilles, as given by Mr. Geo. N. Lawrence. The labors of Mr. Ober were principally devoted during two years to ornithological observation and collection on the island of Dominica, which is about midway in the group known as the Lesser Antilles, being in latitude 15° 20′ to 15° 45′, north; longitude 61° 13′ to 61° 30′ west. The island is mountainous, possessing a range of high peaks and hills from two to three thousand feet in height. It is only in these mountainous sections that land birds of any moment are found, for, in fact, along the coast and in the low valleys very few species other than ordinary sparrows, humming-birds, &c., can be obtained. Owing to the bold, precipitous character of the island coast and the absence of small outlying islands or detached rocky islets, Mr. Ober found that only a few sea birds were resident.

As far as known, the most significant result of Mr. Ober's collection and investigation of the avifauna of the Lesser Antilles is embodied in the statement that each one of these several little islands constituting that group has one or more species peculiar to itself alone.

Mr. W. H. Dall has contributed several papers to the *Proceedings*, describing new forms of mollusks, both recent and belonging to the Tertiary formation, nearly all of which are from the western coast of the United States, several being particularly interesting. One of these forms was brought up on a sounding-line by Capt. Geo. E. Belknap, of the U. S. S. *Tuscarora*, on his celebrated sounding expedition from Japan to California via the Aleutian Islands, in 1874. This mollusk, a species of *Chiton*, came from a depth of 6,066 feet below the surface, a much greater depth than that in which any other species of the genus has yet been known to exist. Many of the other shells and fossils described were due to the exertions of Mr. Henry Hemphill, of California, whose ability as a collector stands unrivalled, and who kindly presented those objects, which he believed to be new, to the National Museum.

Small but interesting collections of shells from "Kitchen Middens," on the Pacific coast of Cósta Rica, were also identified by Mr. Dall. These species, collected by Drs. Flint and Bransford, are still found living in adjacent waters, and are now used for food by the natives.

Mr. Dall also contributed a paper on the Limpets and Chitons of the Alaskan region, with descriptions of genera and species believed to be new. This was illustrated by five plates, representing chiefly the teeth of these animals, worked out by microscopical investigations of his own. Some forty-two forms were figured, only three or four having previously been known. The paper contains a review of the general classification of the *Chitonidæ*, based on the researches of P. P. Carpenter and the author, together with a summary of the known facts in regard to the anatomy and development of these animals, some of which are here stated for the first time. A number of genera and subgenera, proposed by Dr. Carpenter in his unpublished monograph of the *Chitonidæ*, together with others heretofore only partially characterized, are here fully described for the first time.

Mr. R. Ridgway has contributed the following:

(1) *On a new humming-bird* (*Atthis ellioti*) *from Guatemala* (pp. 8–10).—Certain constant differences, previously overlooked by authors, between specimens of *Atthis heloisæ* (Less. & Delattr.) from Mexico and the birds from Guatemala referred to that species are pointed out and illustrated by outline figures. The Guatemalan bird is characterized as a new species, and named in honor of Mr. Daniel Giraud Elliot, the well known ornithologist, and a special authority on this family of birds.

(2) *A review of the American species of the genus Scops* Savigny (pp. 84–117).—This article is an elaborate monograph of the American Scops owls (species allied to the common screech-owl of the United States), embracing the full synonymy and descriptions of the known species, two of which, *S. brasilianus cassini*, from Eastern Mexico, and *S. cooperi*, from Costa Rica, are new to science. The owls of this genus have been particularly perplexing to ornithologists on account of remarkable variations of plumage, some species being "dichromatic," while all vary to an unusual degree, according to locality, the amount of individual variation also being extraordinary. The present paper is an attempt, based upon ample material contained chiefly in the National Museum, to clear away the confusion which has hitherto existed in regard to the relationships and nomenclature of certain forms.

(3) *Notes on the ornithology of Southern Texas, being a list of birds observed in the vicinity of Fort Brown, Texas, from February,* 1876, *to June,* 1878. *By James C. Merrill, Assistant Surgeon, U. S. Army* (pp. 118–173).—The critical remarks and synonymy relating to the species noticed in this article were prepared by Mr. Ridgway, although in several instances, through an oversight of his own, his initials do not appear in connection with his portion of the work. The species thus treated by Mr. Ridgway, are: *Thryomanes bewicki leucogaster* (p. 121), *Vireosylvia flavo-viridis* (p. 125), *Molothrus æneus* (pp. 130–131), *Sturnella magna neglecta* (p. 134), *Myiarchus erythrocercus cooperi* (pp. 138–141), *Nyctidromus albicollis* (pp. 142–145), *Amazilia fuscicaudata* (pp. 147–148), *A. yucatanensis* (pp. 148–149), *Buteo albicaudatus* (pp. 154–156), *Æchmoptila albifrons* (p. 158), and *Parra gymnostoma* (pp. 166–168). Mr. Ridgway is also responsible for the nomenclature adopted in the catalogue.

(4) *Descriptions of several new species and geographical races of birds contained in the collection of the United States National Museum* (pp. 247–252).—The new forms described in this article are the following: *Rhodinocichla rosea schistacea*, from Mazatlan, Western Mexico; *Embernagra rufivirgata crassirostris*, from Eastern Mexico, and the *E. r. verticalis*, from Yucatan; *Loxigilla violacea bahamensis*, from the Bahamas; and *Anas aberti*, from Mazatlan. A description is appended (p. 253) of the adult female of *Anas wyvilliana*, Sclater, a recently discovered Sandwich Island duck, the female of which was previously unknown.

(5) *Description of two new species of birds from Costa Rica, and notes on other rare species from that country* (pp. 252–255).—The new species here described are *Thryophilus zeledoni* and *Pseudocolaptes lawrencii*. The others noticed are the very rare *Carpodectes nitidus*, the young male of which is here for the first time described, and the "*Zonotrichia*", *vulcani*, of Boucard, which is referred to the genus *Junco*, as the most southern form of that genus, of which the common snowbird (*J. hyemalis*) is the representative in Eastern North America. The Costa Rican bird inhabits the almost alpine summit of the volcano of Irazu.

(6) *A partial list of the birds of Central California. By L. Belding, of*

Stockton. Edited by R. Ridgway (pp. 388–449). Mr. Ridgway is to be credited merely with the editing of this paper and the nomenclature adopted. The list is the most complete catalogue extant of Central Californian birds, being based upon the observations of Mr. Belding, made during a residence of about twenty years in the State, and includes 220 species, which, with very few exceptions, are represented in the collection of the National Museum by specimens (upwards of 600 in number) sent by Mr. Belding.

(7) *Descriptions of new species and races of American birds, including a synopsis of the genus Tyrannus*, Cuvier (pp. 466–486).—The new species here described are *Tyrannus luggeri*, from Demerara and Cayenne; *Lichenops perspicillatus andinus*, from Western South America (Chili to Colombia); *Dacnis pulcherrima aureinucha*, from Ecuador; *Parus rufescens neglectus*, from the coast of California.

Smithsonian Annual Report.—The report of the Institution for the year 1878 was presented to Congress on the 8th of February, 1879, and 10,500 copies were ordered to be printed, 1,000 being for the use of the Senate, 3,000 for that of the House of Representatives, and 6,500 for the Smithsonian Institution.

For almost the first time in the history of the Institution, this report has failed to make its appearance, and to be distributed before the close of the following year. Under ordinary circumstances it should have been printed by the 1st of July, but the year has come to an end, and not more than half the number of pages have been set up. This is due to the fact that the extra session of Congress held in March last found the Public Printer without any special appropriation to meet the cost of printing; and instead of going on with the work ordered at the previous session, he was obliged to postpone it. Work was, however, resumed upon the report late in the autumn, and it will probably be finished in the course of a few months. It is earnestly to be hoped that a similar delay will not occur again. The same cause has prevented the printing of the Henry Memorial volume authorized by Congress last winter, but the work on this will soon be begun.

Reports of the United States Fish Commission.—A series of publications which may be considered as in some respects connected with the work of the Institution, not only in the *personnel*, but in the subjects of natural history discussed and in the resulting contributions to our knowledge, may properly be here noticed. The present Secretary being at the head of the United States Commission of Fish and Fisheries, and the work accomplished by this agency in increasing and diffusing scientific as well as practical information being quite within the objects and province of the Institution, much of the material would legitimately form a portion of the Smithsonian Contributions or Miscellaneous Collections. These reports are, however, published by the government, and are distributed by Congress.

ANTHROPOLOGY.

It is well known to the Board that the natural history of primitive man, especially in North America, has always been a special object of the attention of the Smithsonian Institution. The first volume of its series of publications consisted of a work by Messrs. Squier and Davis, entitled "The ancient monuments of the Mississippi Valley," which, appearing in 1848, gave a stimulus to archæological research in America, and added greatly in exciting that high degree of interest in the subject, which now pervades the whole country. The work, although thirty years old, is still a standard publication, and greatly sought after. It had been in contemplation to reprint this work, to meet the great demand; but the destruction of all the wood-cuts by the disastrous fire of 1865 involved so great a cost in their reproduction that nothing has yet been done in the matter.

For the purpose of a more definite inquiry into the subject of mounds, earth-works, and other remains of early man in America, a large edition has been distributed, within a few years past, of a circular prepared at the request of the Smithsonian Institution by Prof. O. T. Mason, and a great many returns have been received, containing more or less valuable information on the subject in question. Some of these responses will appear in the reports of the Institution. The entire material is in Professor Mason's hands for elaboration and the preparation of part of a new and systematic account of the whole subject, taking the memoir of Squier and Davis as a basis.

In view of the fact that some of the most interesting localities of archæological remains in the United States are now being systematically explored and the "finds" removed by foreign governments, it is very desirable that Congress should make the necessary appropriation to enable this work to be done for the benefit of the National Museum. The remains of prehistoric man, as well as illustrations of the life and manners of living savage races, have of late years been considered the most interesting objects of exhibition in all civilized nations, and especially within the last twenty or thirty years, and the greatest efforts are now made everywhere not only to complete the material for each country itself, but to obtain supplementary matter from elsewhere; indeed, so greatly are these aboriginal objects valued in many countries that positive laws prohibiting their exportation are in vogue, as in Denmark, Mexico, &c. The English, German, and French Governments have of late years been particularly active in archæological research in America, Central and South America being until recently the chief field of investigation. Within a short time, however, the French Government, through its agents, has been diligently occupied in collecting prehistoric remains along the coast of California, and is about extending its work into New Mexico and Arizona, Oregon and Alaska, and many tons of the choicest objects have already been removed to Paris. Whatever the feelings of regret on the part of Americans at seeing the removal of articles of such value from our country, and which can never be replaced, there is no redress in the way of prohibiting their collection and its exportation. We may, however, prevent it in the future by our pre-occupying the ground. It is, therefore, to be hoped that Congress will make suitable appropriations for the purpose in question. Ten or twenty thousand dollars expended annually would enable us in a manner to defy foreign competition.

In the sundry civil appropriation bill of March 3, 1879, the following item was included:

"For completing and preparing for publication the contributions to North American ethnology, under the Smithsonian Institution, twenty thousand dollars: *Provided*, That all the archives, records, and materials relating to the Indians of North America, collected by the geographical and geological survey of the Rocky Mountain region, shall be turned over to the Smithsonian Institution, that the work may be completed and prepared for publication under its direction: *Provided*, That it shall meet the approval of the Secretary of the Interior and of the Secretary of the Smithsonian Institution."

Under the authority of this enactment, Major Powell sent out a party to make a renewed examination of the pueblo villages of New Mexico, for the purpose of obtaining more accurate information for publication in the final report, as authorized. Accordingly, Mr. James Stevenson was placed by Major Powell at the head of an expedition, and was accompanied by Mr. Frank H. Cushing, one of the assistants in charge of the ethnological department of the National Museum. With Santa Fé as a starting-point, they explored several localities in that vicinity and elsewhere, and succeeded in obtaining a large collection of everything illustrating the manners and customs of the pueblo towns. The collections made have all been shipped by the Quartermaster's Department, under the order already referred to, and are expected to arrive in a few weeks. The whole mass occupies nearly one hundred boxes.

The operations of Messrs. Stevenson and Cushing have been much facilitated by means of letters furnished by the Secretary of War and Generals Sherman and Meigs to the officers of the military posts.* General Hatch took a special interest in the subject, and issued a circular calling attention to the mission of the party, and inviting cooperation

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*WAR DEPARTMENT,
QUARTERMASTER-GENERAL'S OFFICE,
Washington, D. C., June 19, 1879.

SIR: You are respectfully informed that your communication of the 12th instant, requesting that a circular be issued authorizing the Quartermaster's Department to receive from parties living at or near military posts and to forward to Washington any articles intended for the National Museum, has been referred by the Secretary of War to this office for report, and this day returned with the following remarks:

"The Quartermaster's Department, under existing orders, transports to the National Museum the collections of United States surveys and exploring expeditions, organized under the War Department.

"The law of March 3, 1879 (Forty-fifth Congress, third session, chap. 182), makes from all quarters. The effect of this was seen in the ready assistance rendered, and in the numerous contributions by both the military and civil residents of the district. The material result of this expedition will perhaps be thrown in the shade by the information obtained by Mr. Cushing in regard to the manners and customs of the Indians. Securing their confidence to a greater degree than any preceding traveller, his presence has been permitted at the performance of their most sacred rites; and the publication of his report by Major Powell may be looked for as promising to be of intense interest.

A very important addition made during the year to the ethnological department of the National Museum is the collection of Indian portraits and scenes painted by Mr. George Catlin, and presented by Mrs. Harrison, widow of Thomas Harrison, of Philadelphia.

There have been two of the so-called Catlin collections. The first is that which was exhibited by Mr. Catlin many years ago, in the United States, and afterwards taken to Europe and shown in the principal capitals. It made Mr. Catlin's reputation as an artist and ethnologist, and furnished the material for his great work on the North American Indians.

Several years ago, Mr. Harrison, being in Belgium, found Mr. Catlin there very much embarrassed financially, and in danger of having his entire gallery sold for a trifle. He advanced the money to relieve Mr. Catlin's embarrassment, and took the collection as security, with the understanding that at any time within a certain period of years it could be redeemed. This was out of Mr. Catlin's power, and the collection was transferred to Philadelphia, where it was stored for many years, and, as stated, has just been presented by Mrs. Harrison.

After parting with his first gallery, Mr. Catlin traveled extensively in Western North America and through South America, and obtained many additional sketches of much interest. This second collection was brought some years ago by him to Washington in the hope of selling it to the government, and was exhibited in the upper hall of the Smith-

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the National Museum the ultimate place of deposit and safe custody of all these collections.

"It, under the laws and orders relating to the Centennial Exhibition, transported to Philadelphia various and extensive collections for that exhibition; many, if not most, of which were finally brought to Washington, for deposit in the National Museum.

"I recommend that the request of the director of the National Museum and Secretary of the Smithsonian Institution be granted."

Very respectfully, your obedient servant,

M. C. MEIGS,
Quartermaster-General, Brevet Major-General, U. S. A.

Prof. SPENCER F. BAIRD,
Secretary Smithsonian Institution, Washington, D. C.

WAR DEPARTMENT,
Washington, D. C., June 21, 1879.

SIR: Replying to your letter of the 12th instant, in which you request that the Quartermaster's Department be authorized to receive from parties living at or near sonian Building (then otherwise unoccupied), under the care of Mr. Catlin himself. He, however, died before anything was accomplished, and the pictures were packed up and stored in the Smithsonian basement until 1876, when the heirs had them transferred, for the purpose of exhibition at the Centennial. They are still displayed in Philadelphia as a part of the collections of the permanent exhibition.

Among particularly noteworthy contributions to the Museum during the year is a series of specimens of North African pottery, furnished by Mr. George Maw, of England, to whom the National Museum is indebted for the donation of his display of ceramic wares made at Philadelphia and which is now in the permanent exhibition building.

The National Museum of Mexico has furnished a cast of the calendar stone of the city of Mexico, and the originals of many rare and remarkable articles.

A collection of Brazilian pottery by Mr. Steere has already been mentioned, as also a fine collection of New Mexican objects by Mr. Metcalfe. An extremely interesting collection of prehistoric articles of France and other localities in Europe was presented by Mr. Gaston L. Feuardent, of New York. The great archæological knowledge of this gentleman renders this collection particularly valuable in the authentic indication of the character of the different pieces.

Under the general head of "Explorations" will be found mentioned a considerable number of researches, having in view the collecting of

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military posts, and to forward to Washington, by the usual military channels, any articles intended for the National Museum, I have the honor to inform you that instructions have been given in accordance with your wishes.

Very respectfully,

G. W. McCRARY,
Secretary of War.

Prof. SPENCER F. BAIRD,
Secretary Smithsonian Institution.

[General Orders No. 65.]

HEADQUARTERS OF THE ARMY,
ADJUTANT GENERAL'S OFFICE,
Washington, July 1, 1879.

By direction of the Secretary of War, the following is published:

The Quartermaster's Department is authorized to receive from parties living at or near military posts any articles intended for the National Museum, and forward them to Washington, under the regulations governing transportation of military property, and on the same forms of bills of lading. The packages to be marked, "National Museum, care Depot Quartermaster, Washington, D. C.," and settlement to be made by the Quartermaster's Department.

By command of GENERAL SHERMAN:

E. D. TOWNSEND,
Adjutant General.

HEADQUARTERS DISTRICT OF NEW MEXICO,
Santa Fé, N. M., September 5, 1879.

To all officers of the Army serving in the district of New Mexico:

The following letter is published for your information:

As Mr. James Stevenson may find it impossible to visit all posts of the district, offiarchæological and anthropological material, and the list of donations gives an account of those of less moment. The most important explorations are those of Major Powell and Mr. E. W. Nelson.

Considering the subject geographically, we may refer, for Alaska, to the labors of Messrs. Nelson and Turner; for New Mexico, to those of Messrs. Metcalfe, Stevenson, and Cushing. From the interior of the United States the archæological collections have been very many, and will be found detailed in the list of donations.

From Mexico the most important material has been furnished by the National Museum of Mexico and by Professor Dugès. From the former have been received a very excellent model of the famous calendar-stone, and numerous articles of obsidian, stone, pottery, &c. Professor Dugès has contributed a diminutive human face carved in iron pyrites, with small opals for eyes. The collections of Professor Steere, from Brazil, have already been referred to. From Europe we have a very interesting collection of prehistoric remains, especially from France, presented by Mr. Gaston L. Feuardent; and pottery from Persia, Morocco, and other countries, by Mr. George Maw, of London.

Casts of Indian heads.—Reference was made in the report for 1877 to a series of casts, made by Mr. Clark Mills, at the joint expense of the Smithsonian Institution and the Peabody Museum at Cambridge, of the faces of sixty-five Indians held as prisoners of war at Saint Augustine, in Florida, these representing quite a number of different tribes and furnishing a very rare opportunity of securing life-like reproductions of the Indian physiognomy. The Indians, as a rule, are averse to such an operation, and but few such casts are extant in any anthropological museum. The few series distributed of duplicates of these representations have been much appreciated.

After the discharge of the Saint Augustine prisoners, or their trans-

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cers serving therein are solicited to contribute any Indian relics, specimens of natural history, curiosities, &c., that may be obtainable in their neighborhood, and address them to Mr. Stevenson, care of chief quartermaster, district of New Mexico, sending the same by any government transportation leaving their posts for Santa Fé.

EDWARD HATCH,
Colonel Ninth Cavalry, Commanding.

"SMITHSONIAN INSTITUTION, *Washington, July* 7, 1879.

"Mr. James Stevenson, the bearer of this letter, has been instructed by the Smithsonian Institution to visit New Mexico, Arizona, and other portions of the Southwest for the purpose of prosecuting investigations in ethnology and natural history.

"I therefore commend him to the kind attention of officers of the United States Army, civilian officers of the United States Government, correspondents of the Smithsonian Institution, and the friends of science generally. All aid rendered him in his work or contributions of specimens through him to the National Museum of the United States, will be duly acknowledged by the Smithsonian Institution.

"Mr. Stevenson is authorized to make use of all facilities granted to the Smithsonian Institution by railroad companies and the War Department in the transportation of collections made or otherwise obtained by him.

"SPENCER F. BAIRD,
"*Secretary Smithsonian Institution.*"

fer to other stations, Capt. R. H. Pratt, United States Infantry, who had them in command, and who had become greatly interested in all measures looking towards the education of the Indians, was authorized by the government to bring a number of young Indians of both sexes to the school for colored youth so successfully conducted by General Armstrong at Hampton, Va. This having been accomplished, an opportunity was furnished of extending the series of casts, and Mr. Clark Mills again volunteered his services to do the work, simply for his expenses. Captain Pratt accordingly made the arrangements for its execution. This second series makes the entire number of representations of Indians in the museum about one hundred. These casts are valuable to us, both as anthropologic representations in themselves and as furnishing the means of producing lay figures in great number and variety to display the many sets of Indian clothing and equipment now forming part of the general collection.

In this connection it may be mentioned that Captain Pratt has more recently established a special school for the education of Indian youth, of both sexes, at Carlisle, Pa., using the government barracks for its accommodation. Here he expects to bring together between three and four hundred individuals and has every assurance of a successful experiment.

EXPLORATIONS.

Among the operations of the Smithsonian Institution, especially fostered from the beginning by my predecessor, and looked upon by him as one of its most important functions, is that of exploration in little-known regions of North America. It was his policy not to use the funds of the Institution in purchasing collections already made, but rather, by means of occasional grants of money in small sums, either to fit out small parties starting from Washington, or to assist correspondents of the Institution, wherever they might be resident, in making researches in their own vicinity. These labors generally included more than one branch of science, and in their aggregate have tended very largely to give the National Museum its remarkable number of type specimens. Thus grants of money were made, of various sums, from $5 to $250, very rarely exceeding the latter amount in any one year to any one agent.

The results of the explorations condensed in whole or in part by the Smithsonian Institution, in 1879, have not been inferior in importance to those of any previous year; in fact they have seldom been exceeded; resulting not only in bringing together many new facts in natural history and ethnology, but also in adding large collections to those already in hand. The prospect of having a new building capacious enough to accommodate whatever may be received in this direction was an encouragement to utilize opportunities of obtaining objects, from which we were formerly deterred by want of space.

Among the more important explorations made under the auspices of the Smithsonian Institution in 1879, may be mentioned that of Mr. E. W.

Nelson in Northwestern Alaska. As explained in previous reports, Mr. Nelson was nominated by the Smithsonian Institution to General Myer as a signal observer at Saint Michael's, a station on Norton Sound, south of Behring Strait—a district of very great interest in both an ethnological and natural-history point of view; and although numerous collections had previously been received from that region, as made by Messrs. Dall, Kennicott, Pease, Bannister, and Turner, there was still enough unaccomplished to make it important that the work should be continued. The institution was fortunate in being able to secure the aid of Mr. Nelson, as being a most excellent naturalist and particularly well acquainted with the vertebrate animals of North America.

Mr. Nelson proceeded to his station at Saint Michael's, and has remained there ever since, of course devoting the principal portion of his time to his duties as signal observer, and, it is understood, to the satisfaction of his superiors, while his leisure has been employed in making observations and collections of natural history. Previous reports have noted the additions already made by him. The collection of 1879 is especially important in an ethnological point of view; not less than three thousand specimens of Indian and Esquimaux work in the way of carvings, implements, clothing, domestic and household utensils, games, &c., have been received. These filled fourteen large boxes, the remainder of the collection consisting chiefly of birds, eggs, and fishes. The total number of pieces furnished by Mr. Nelson amounts to 2,935.

Mr. Nelson is preparing an elaborate report on the natural history and ethnology of Northwestern Alaska for publication after his return.

The labors of Mr. Lucien M. Turner in the Aleutian Islands have also been prosecuted during the year, and have furnished, as heretofore, a large amount of interesting material for the National Museum.

Mr. Turner, as mentioned in previous reports, like Mr. Nelson, is one of the observers of the United States Signal Service, and has under his charge a number of temporary stations along the entire extent of the Aleutian Islands. The supervision of these stations makes it necessary for him to go from point to point as an opportunity is furnished, thus allowing a chance to study the natural history and ethnology of a widely-extended region. The greater part of the season of 1879 was passed at Sitka, his principal station, however, being Unalaska. Among the collections sent down by him, besides some very finely-prepared specimens of birds (among them species of great rarity), was a series of very elaborate, and delicate carvings in bone made by the Aleutian Islanders.

Capt. L. A. Beardslee, of the Navy, who for several years had been detailed by the Navy Department to take charge of the steamers furnished to the United States Fish Commission, especially the "Blue Light" and the "Speedwell," was sent out during the early part of the year in command of the sloop-of-war Jamestown to look after the interest of the citizens of the United States in Alaskan waters. With

Sitka as his headquarters he was enabled to exercise a supervision over the Indians of the adjacent parts of the country.

The experience which Captain Beardslee acquired during his service with the Fish Commission, in making observations on the natural and physical conditions of the water, prepared him more fully for his researches in this new field, and the Institution gladly accepted his offer of service and supplied him with necessary apparatus. No specimens have so far been received from Captain Beardslee, but a consignment is expected in the early part of 1880.

An extensive exploration of the islands and waters of the North Pacific, indeed even through Behring Strait, was made during the last summer by the "Richard Rush," Captain Bailey, commander. Before starting, her surgeon, Dr. White, of the Marine Hospital Service, offered his services to the Institution in making such collections as might be designated; and as a trained naturalist, experienced in research, having prosecuted his studies in Edinburgh under the direction of Sir Wyville Thompson and others, his proposition was gladly accepted. Many collections of much interest were made by Dr. White and duly received by the Smithsonian Institution. They consist for the most part of embryonic or fœtal seals, porpoises, &c., various fishes, and many marine invertebrates. Skins and skeletons of several species of seals were also included.

The "Jeannette."—Much interest was excited during the past year by the announcement that the "Pandora," an English vessel, which had already been engaged in Arctic research in the hands of Capt. Allen Young was to be employed in a similar service, entirely at the expense of Mr. James Gordon Bennett, of New York, as the "Jeannette," under the command of Lieutenant De Long, an officer of the United States Navy, who had already had a Northern experience in the Greenland Seas while in search of the "Polaris." The "Jeannette" was taken by Lieutenant De Long to San Francisco, by way of Cape Horn; her commander returning overland to the East, and spending some time in Washington in obtaining his outfit and instructions. The Smithsonian Institution was requested by Mr. Bennett to nominate a competent naturalist for the expedition, and selected Mr. Raymond L. Newcombe, of Salem, Mass., who joined the steamer in San Francisco, and with her left for the North. Letters received, both from him and Captain De Long, and written at Saint Michael's, Alaska, show that a large amount of work has been accomplished in the way of natural history research; and it is hoped that the results of the expedition will be commensurate with the expectations of all interested. At the last advices from the "Jeannette" she was seen by a whaling captain in the vicinity of Wrangel Land, this being her main objective point.

Professor Jordan, who has been detailed by Mr. Goode to work up the fisheries of the Pacific coast of the United States, reported at the Smithsonian Institution in Washington, in December, 1879, and there received the necessary instructions for his work. At the latest advices he had reached San Diego and commenced his investigations of the fisheries, with the promise of exhaustive results there and at other points on the coast. He is provided by the National Museum with the necessary apparatus for making collections on a liberal scale, to serve as illustrations of the fishery statistics.

The collecting and exhibition of what may be considered vouchers of his labors are very necessary, since the names of our Eastern species are largely applied to Western forms in every respect different from them; and without the means of examination and comparison much confusion would result. Thus, what is called cod in San Francisco has no relation to the cod of the Eastern coast, belonging to an entirely different group.

Among the explorations of the year, and especially rich in ethnological results, is that prosecuted by Mr. S. T. Walker, on the west coast of Florida. With this gentlemen the Institution has been in communication for several years, and has received from him many valuable archæological objects. During the past year he has been engaged in a systematic survey of the mounds in the vicinity of Clear Water, Fla., and has found evidence to show that at the time of their construction white men were in the vicinity, from whom were obtained numerous articles of ornament, &c. Conspicuous among these are gold and silver beads, portions of bronze fittings of gun locks, Venetian beads, fragments of Spanish pottery, &c. From all the indications, it is possible that these were obtained from some of the early Spanish invaders, or other whites, at no distant period from the time of De Soto's conquest.

Many collections of reptiles, living and in alcohol, fishes, mammals, and birds have also been furnished by Mr. Walker.

Mr. James W. Milner, the Assistant Fish Commissioner of the United States, was obliged by ill health to spend the winter of 1878-'79 in Florida, making his home at Homosassa, on the west coast. Here, although greatly enfeebled by disease which in a great measure crippled his efforts, he obtained, with the help of those about him, very valuable collections of prehistoric remains, birds, fishes, and other natural-history objects.

Mexico.—Mr. Silas Stearns, formerly of Pensacola, and for several years a valued correspondent of the Smithsonian Institution, in the early part of last summer was detailed by Mr. Goode to collect the statistics of fish and the fisheries on the Gulf of Mexico in the interest of the fisheries branch of the census. For this purpose he chartered a small sloop for use in prosecuting his work. From time to time, without interfering with his regular duty, he has succeeded in securing numerous objects of natural history for the National Museum, among them quite a number of fish, some of these, probably, new to science.

Mr. Robert Ridgway, curator of ornithology in the National Museum, accompanied by a friend, Mr. H. W. Henshaw, made an expedition to

Cobb's Island, off the Eastern Shore of Virginia, during the past summer, for the purpose of collecting skins of the adult and young water birds abounding in that vicinity. Although rather late in their undertaking (July 29) they were quite successful, obtaining a number of interesting species during their stay of ten days.

For several years past Mr. F. A. Ober has been engaged, under the auspices of the Smithsonian Institution, in making observations and collections in natural history and archæology in the West India Islands; this group, strange as it may appear, furnishing almost a virgin field of research. In the course of his labors, beginning in 1877, Mr. Ober visited a number of the islands and collected many specimens; of these the birds have already been worked up, fully catalogued, and described by Mr. Lawrence in the proceedings of the National Museum. No less than twenty new species of birds have been added to science, and a great deal of information obtained in regard to their geographical distribution. The National Museum is now in possession of what is believed to be the most complete collection of West Indian birds extant; a very important corollary to its North and Central American series. The other collections made by Mr. Ober were mainly of archæological objects and reptiles.

Mr. Ober has lately published an interesting account of his travels, entitled "Camps in the Caribees."

Prof. J. B. Steere, of the University of Michigan, at Ann Arbor, who has an excellent record as an explorer in China, Formosa, and elsewhere, invited the Smithsonian Institution to a co-operation in a proposed exploration of the Amazon River during the past summer. He was accordingly provided with certain apparatus and material for collecting, and made excellent use of his opportunities. Since his return he has contributed to the National Museum a collection of the ancient pottery from the island of Maranon, and other localities in the Amazon River, thus filling a very serious gap in our archæological museum. During Professor Steere's previous explorations in the East, the Smithsonian Institution was the consignee of his collections, and rendered much service in securing their safe and inexpensive transmission to America.

Dr. Charles J. Hering, of Paramaribo, Surinam, still maintains his interest in the Smithsonian Institution, by sending to it collections in natural history and archæology. Several parcels have been forwarded by him during the past year, the contents of which will be mentioned under his name in the list of acquisitions.

Dr. Otto Finsch, the eminent ornithologist and naturalist, and for many years director of the Natural History Museum at Bremen, in Germany, after completing his recent explorations in Siberia, undertook to visit the islands of the Pacific Ocean, partly in the interest of the Berlin Museum, partly at the expense of the Humboldt Exploration Fund, and partly at his own.

Having offered his services to the United States Fish Commission in any way connected with his labors, he was requested to bring over a consignment of German carp, a fish which promises to be of great value in American pisciculture. This was done by him, and he delivered to the United States carp ponds, in Washington, a number of these fishes in a healthy condition, which, it is hoped, will, in a few years, be the progenitors of a large number of that species of fish.

In order to enable Dr. Finsch to carry on his polynesian researches to better advantage and at less expense to himself, free passes and reduced passage tickets for himself and party were obtained from several of the transcontinental railroad companies. The Smithsonian Institution provided Dr. Finsch with a partial outfit for marine exploration, including a supply of alcohol for the preservation of reptiles and fishes. Dr. Finsch proceeded first to the Sandwich Islands, and then to the Fijis, and at the latest advices he had reached one of the groups of the Marshall Islands.

EXCHANGES.

As was explained in the report for 1878, the system of international exchanges organized by the Smithsonian Institution nearly thirty years ago has long been considered one of its most important functions, and no greater obstruction to the intercourse between the scientific institutions of the Old World and New can be imagined than that of an interruption of this work. As already stated, an organization intended primarily to aid in the prompt transmission of the publications of the Institution to its correspondents, at home and abroad, was extended so as to include the corresponding exchanges of other institutions; this has now resulted in furnishing by far the most extensive system of exchanges in existence, the benefits of which are experienced and appreciated all over the world.

The foreign agencies employed in the Smithsonian exchanges are of three classes.

First. Individuals or firms, some of them salaried by the Institution and devoting more or less of their time to its work.

Second. Learned societies or universities, which do on a small scale in their respective countries what the Smithsonian Institution does on a larger scale for the world in general.

Third. Special government bureaus of international exchange, organized for the purpose. It is quite probable that the number of this class, now restricted to four, namely, the Commission Belge des échanges internationaux, the Commission Française des échanges internationaux, the Bureau central scientifique of Haarlem, and the Bundes Canzlei for Switzerland, will be increased until, possibly, in time, the greater part of the service in Europe in connection with the Smithsonian Institution, may be performed by them. This will, of course, constitute a very desirable aid to the Smithsonian Institution and to the second class mentioned, especially as to the expenses of the work.

The operations of the Commission Française des échanges internationaux, inaugurated in 1878, have constantly improved in extent and efficiency through 1879, a large number of boxes having been exchanged between it and the Smithsonian Institution to the entire satisfaction of both parties. Numerous applications have been made by the French bureau to the Smithsonian Institution for special works, public or private, required by the governmental bureaus, especially for the national library, the ministry of public instruction, etc. On receipt of these applications circulars were sent to various parties interested, and a large number of acceptable returns promptly received and duly forwarded by the Institution. On the other hand applications by the Institution in behalf of American bodies have been satisfactorily answered. This feature of the system of international exchanges is one of great importance.

In addition to the official applications for special publications of the United States, made through the system of international exchanges, one was presented by the French minister to the Smithsonian Institution for the reports of the United States Fish Commission, those of the several State fish commissions, and any other documents serving to illustrate the steps taken for the propagation and utilization of fishes in the United States. This request was in behalf of the Senate of France, which recently appointed a commission to investigate the relations between citizens and the State in respect to the rights and conditions of fishing in both fresh and salt waters. A circular was accordingly addressed to the parties indicated, and quite a complete series of documents was obtained and transmitted to Monsieur Outrey, the minister. He has acknowledged with thanks the receipt of the package, and given assurance of his appreciation of the courtesy.

It has already been explained that the Smithsonian Institution not only serves as a medium of exchange to institutions and individuals in the United States, but also to those of Canada, Central America, Mexico, the West Indies, and South America. An extra amount of labor has been imposed upon the Institution, during the past year, owing, in large part, to the interruption of operations in 1878, caused by the death of Professor Henry. The accumulated material of that year has, however, all been disposed of, together with the receipts of 1879; the aggregate being shown in the accompanying schedule. It is quite likely that operations in this line during 1880 will be but little behind those of 1879, as, for years, there has been a steady increase in the bulk of the exchanges; and this is not likely to be interrupted.

In the preceding report reference was made to the adoption of a rule, under authority granted by the Board of Regents, by which packages received from the government bureaus were charged a uniform rate of five cents per pound for packing, boxing, and shipping to destination. This has been carried into effect, but has only secured the return of about a hundred dollars, evidently not a sufficient sum to affect materially the expense of the exchange system—a very onerous burden upon the funds of the Institution, and greatly affecting its operations. Formerly, when the cost of the exchanges amounted to only two or three thousand dollars a year, the publications of the Institution were of much greater extent than they are now; and it is to be hoped that some provision may be made by which the expenses of exchange may be materially lessened, and the former very desirable prominence of the publication department be restored. It is a question whether the assistance of Congress might not be invoked to make an appropriation to bear at least a part of the cost. If a few thousand dollars were furnished by the Government, it would be of very material aid and tend greatly to relieve the Institution of a burden which is fast becoming oppressive. One special argument in favor of such Congressional action is found in the fact that, while this system of exchanges benefits equally all the libraries and societies of the country, the benefit of the returns inuring to the Smithsonian Institution is experienced directly by Congress; the expenditures for both publications and exchanges being actually in the interest of the Congressional Library, in which all the Smithsonian books are now deposited. It may safely be said that if the amount of money used in carrying on the exchanges was expended directly in the purchase of books for the Library of Congress, it would not produce the same yield, in view of the fact that these returns to the Smithsonian Institution consist largely of the publications of societies interested in the prosecution of theoretical and applied science, which, while embracing the earliest announcement of important discoveries, are for the most part not on sale, and only to be obtained by a system of exchange.

As in previous years, the following transportation companies have favored the Institution by a remission of charges upon its packages, and thus enabled it to carry on its system of international exchanges with a fraction of the expense which would otherwise have been required.

Anchor Steamship Company.
Atlas Steamship Company.
Companie Générale Transatlantique.
Cunard Steamship Company.
Hamburg American Packet Company.
Inman Steamship Company.
Merchants' Line of Steamers.
Netherland-American Steam Navigation Company.
New York and Brazil Steamship Company.
New York and Mexico Steamship Company.
North German Lloyd Steamship Company.
Pacific Mail Steamship Company.
Pacific Steam Navigation Company.
Panama Railroad Company.
White Cross Line of Antwerp.

The special thanks of the Institution are again tendered to the above-mentioned companies for their enlightened liberality.

In addition to this, through the mediation of Mr. Isaac Hinckley, president of the Philadelphia, Wilmington and Baltimore Railroad Company, the four roads forming the connection between New York and Washington, namely, the Pennsylvania Railroad, the Philadelphia, Wilmington and Baltimore, the Baltimore and Potomac, and Baltimore and Ohio, have agreed to a reduction to one-half of the usual charges on first-class freight. The saving from this concession, although not quite equal to that of free freights by the ocean steamers, is a matter of very great importance, and is deserving of special acknowledgment.

Messrs. Murray, Ferris & Co., of 62 South street, New York, have granted free freight to the Bahamas.

Statistics of exchanges sent during the last ten years.

	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Number of boxes	121	108	179	196	131	208	323	397	309	311
Bulk in cubic feet	1, 189	772	954	1, 476	933	1, 503	2, 261	2, 779	2, 160	2, 177
Weight	31, 383	28, 950	26, 850	44, 236	27, 990	45, 300	80, 750	99, 250	69, 220	69, 975

The following table exhibits the number of foreign establishments with which the Institution is at present in correspondence, or, in other words, to which it sends publications and from which it receives others in return:

Foreign institutions in correspondence with the Smithsonian Institution.

Algeria	6
Argentine Republic	17
Australia and Tasmania	44
Austria-Hungary	163
Belgium	112
Bolivia	1
Brazil	11
British America	20
British Guiana	3
Cape Colonies and St. Helena	7
Central America	2
Chili	8
China	6
Colombia	3
Denmark	29
Dutch Guiana	1
Ecuador	1
Egypt	8
France	358
Germany	541
Great Britain and Ireland	401
Greece	10
Holland	74
Iceland	4
India	34
Italy	198
Japan	5
Java	5
Liberia	1
Mauritius	4
Mexico	18
New Zealand	16
Norway	25
Paraguay	1
Peru	4
Philippine Islands	3
Portugal	35
Russia	163
Sandwich Islands	2
Spain	25
Sweden	22
Switzerland	76
Turkey	13
Uruguay	5
Venezuela	2
West Indies	12
International societies	7
Total	2, 481

Exchange of Government documents.—It will be remembered that some years ago Congress directed that fifty sets of all government publications, whether printed by order of Congress or of the departments, should be placed at the command of the Joint Library Committee for the purpose of exchange for corresponding publications of other nations. This work was intrusted to the Smithsonian Institution, by which it was carried on for a number of years.

An appropriation of one thousand dollars is made by Congress for purposes connected with this exchange, of which a portion is paid for freight and expenses on boxes of books received by the library through the Institution. The returns received are increasing rapidly in value, and in a few years may be expected to nearly or quite equal the transmissions.

In accordance with the law relative to the exchange of the official publications of the United States Government for those of foreign nations, sixty boxes of documents were forwarded during the past year, as shown by the following list of distribution:

International exchange of government publications in 1879.

	Boxes.
Argentine Republic	1
Bavaria	1
Belgium	1
Brazil	1
Buenos Ayres	1
Canada (Ottawa)	1
Canada (Toronto)	1
Chili	1
Denmark	10
France	11
Germany	1
Greece	1
Hayti	1
Holland	1
Japan	1
Mexico	1
New South Wales	1
New Zealand	1
Norway	1
Portugal	1
Prussia	1
Queensland	1
Saxony	1
South Australia	1
Spain	1
Sweden	1
Switzerland	1
Tasmania	1
Turkey	1
Venezuela	1
Victoria	1
Würtemberg	10
Total	60

LIBRARY.

A steady increase in the number of additions to the library of the Institution has, as usual, characterized the year just past, the aggregate, amounting to 10,203 books, pamphlets, and charts, as compared with 8,729 in the previous year. The greater portion of these works have already been transferred to the library of Congress, in accordance with the arrangements of previous years, where, however, owing to the very crowded condition of the shelves, they are not very serviceable. It is much to be hoped, in the interest of the Institution, that some measures may soon be adopted by Congress for increasing the accommodations of the library, and consequent accessibility to its volumes on the part of students.

As heretofore, the great mass of additions to the library consists of the transactions of learned societies, which, indeed, constitute its most important feature. Books published in the regular way can be purchased without any difficulty through established agencies. Transactions of societies, however, are for the most part, only to be had by an exchange, and it would be almost impossible to secure the works obtained by the Institution through its exchanges, with any reasonable amount of money and to any degree of completeness. Every year new scientific associations are being formed, and these, for the most part, take the initiative in seeking an exchange with this establishment.

Of course the older societies are seldom able to furnish volumes of their series which date very far back; but the Smithsonian Institution has succeeded in completing its sets, partly by purchase of such as have drifted into the second hand or antiquarian book trade, and partly by exchange with public libraries possessing duplicates. It is confidently believed that the library of the Institution, and consequently that of Congress, is in possession of a larger and more perfect series of such transactions, as also, of scientific periodicals than any other library extant.

The accompanying memorandum gives an indication of some of the more important additions to the library.

The receipts from the system of Congressional exchanges already referred to, by which fifty sets of the publications of the government are available for exchanges with foreign governments have also been very great; but as these are not catalogued, but transferred directly to the library of Congress, it is, of course, to the report of Mr. Spofford that reference must be had for details.

Statement of the books, maps, and charts received by the Smithsonian Institution during the year ending December 31, 1879.

Volumes:		
Octavo, or smaller	1,509	
Quarto, or larger	440	
		1,949
Parts of volumes:		
Octavo, or smaller	3,240	
Quarto, or larger	2,612	
		5,852
Pamphlets:		
Octavo, or smaller	1,628	
Quarto or larger	591	
		2,219
Maps and charts		183
Total		10,203

List of some of the more valuable works received in 1879.

From the Norwegian Geographical Institute, Christiania: Historisk Beretning om Norges Geografiske op Maaling, 1873–1876, af C. M. de Seue. Kristiania, 1878. 8vo. Aarbog for Handelsmarinen. 1875, ii; 1876, i, ii; 1877, i, ii; 1878, i. Kristiania. 8vo. And 19 maps.

From the Society of Agriculture, Sciences, and Arts, Valenciennes: Mémoires. vols. iii, vi, ix. Valenciennes, 1841–1855. 8vo. Mémoires historiques sur l'arrondissement de Valenciennes. vols. ii, v. Valenciennes, 1868–'78. 8vo. Revue agricole, industrielle, littéraire et artistique. vols. v–xxxi. Valenciennes, 1853–'78. 8vo.

From the Imperial Society of Friends of Natural Sciences, Anthropology, and Ethnology, Moscow: Ezoyistia (Bulletin, 55 parts), 1866–78. Moscow. 4to.

From the Bodleian Library, Oxford: Calendar of the Clarendon state papers, 1523–1657. vols. i–iii. Oxford, 1872–76. 8vo. Calendar of charters and rolls preserved in the Bodleian Library. Oxford, 1878. 8vo.

From the Ministry of Public Instruction and Worship, Paris: Compte général du matériel du dép. de la marine et des colonies, 1874. Paris, 1878. folio. Journal des savants, 1877, 1878, 1879. Paris. 4to. (35 parts.) Nouvelles archives du Museum d'histoire naturelle. 2e série, tome i. 1878. Paris. 4to. (2 copies.) Exposition universelle de Vienne, 1873. France. Rapports. vols. 1–5. Paris, 1875. 8vo. Annuaire de la marine et des colonies. 1878, 1879. Paris. 8vo. (2 copies.) Tableaux de population, de culture, de commerce et de navigation. 1865–76. Paris. 8vo. (24 vols.) Voyage géologique dans les républiques de Guatemala et de Salvador, par MM. A. Dollfus et E. de Mont-Serrat. Paris. 1878. 4to. Annuaire statistique de la France. Année i, 1878. Paris. 8vo. Notice sur la déportation à la Nouvelle-Calédonie, 1874, 1876, 1878. Paris. 8vo. (6 vols.) Notice sur la transportation à la Guyane française et à la Nouvelle-Calédonie, 1868–75. Paris. 8vo. Statistique des pêches maritimes. 1875. Paris. 8vo. (2 copies.) Monnaies à légendes arabes frappées en Syrie par les croises par Henri Lavoix. Paris, 1877. 8vo. Énumération des arbres et arbrisseaux cultivés à Legrer, par A. Lavallée. Paris, 1877. 8vo. Grammaire Malgache, par Marre de Marin. Paris, 1876. 8vo. Théorie des fonctions de variables imaginaires, par Maximilien Marie. vols. i–iii. Paris, 1874–76. 8vo. Inventaire général et méthodique des manuscrits français de la Bibliothèque nationale. vol. ii. Paris, 1878. 8vo. Études égyptologiques. 8, 10, 11. Paris, 1877, 1878. 4to. Mélanges d'archéologie égyptienne et assyrienne. 9, 10. Paris, 1877, 1878. 4to. Catalogue de la Bibliothèque de la ville de Lille, and other works. 8 vols. Lille, 1839–79. 8vo. Œuvres complètes de La Place. vols. i–iii. Paris, 1878. 4to. Dionysii Byzantii de Bospori navigatione, par C. Wescher. Paris, 1874. 4to. De la température du corps humain, par P. Lorain. Tomes i, ii. Paris, 1877. 8vo. Dictionnaire de la langue Déné Dindjié, par le R. P. E. Pelitot. Paris, 1876. 4to. Vocabulaire français-esquimau, par le R. P. E. Pelitot. Paris, 1876. 4to. Dictionnaire d'archéologie égyptienne, par Paul Pierret. Paris, 1875. 8vo. Théorie des fonctions de variables imaginaires, par M. Marie. Paris, 1874–76. 8vo. Tome i–iii. Six charts and 31 volumes, 36 parts and 34 pamphlets, government documents.

From the Belgian Commission of International Exchanges, Brussels: Messager des sciences historiques de Belgique, 1833–75. Gand. 8vo. (44 vols.) Documents et rapports de la Société paléontologique et archéologique de Charleroi. vols. i–iii. Mons, 1866–70. 8vo. Bulletin de la Société royale linnéenne de Bruxelles. vols. i–vi. Bruxelles, 1872–77. 8vo. Bulletins de l'Académie royale des sciences, des lettres et des beaux-arts de Belgique, 1832–75. Bruxelles. 8vo. Annales des travaux publics de Belgique. vols. i–xxxiii. Bruxelles, 1843–75. 8vo.

Annuaire de l'Académie royale de Belgique. vols. i–xliii. Bruxelles, 1835–75. 12mo. Annales de l'Académie d'archéologie de Belgique. 2e série. vols. i–x. 3e serie. vol. i. Anvers, 1865–75. 8vo. Bulletin de l'Académie d'archéologie de Belgique. Fasc. i–xi. Anvers, 1868–74. 8vo. Documents inédits concernant l'histoire de la Belgique, publiés par L. P. Gachard. vols. i–iii. Bruxelles, 1834–35. 8vo. Compte-rendu des séances de la Commission royale d'histoire, ou recueil de ses bulletins. 1834–72. Bruxelles. 8vo. (45 vols.) Fraissart. Étude littéraire. vols. i–2. Bruxelles, 1857. 8vo. Histoire de la maison de Saxe-Coburg-Gotha, par A. Scheler. Bruxelles, 1846. 8vo. Dictionnaire d'étymologie française, par A. Scheler. Nouvelle édition. Bruxelles, 1873. 8vo. Revue de la numismatique belge. Années i–xxxiv. 1842–78. Bruxelles. 8vo. Histoire du règne de Charles Quint en Belgique, par A. Henne. Tomes i–x. Bruxelles, 1858–60. 8vo. Histoire de la Flandre, par L. A. Warnkœnig. vols. i–ii. Bruxelles, 1835–36. 8vo. Imprimeurs belges et néerlandais à l'étranger. Tome i. Gand, 1856. 8vo. Histoire des biliothèques de Belgique, par A. Voisin. Gand, 1840. 8vo. Bulletin des commissions royales d'art et d'archéologie. Années i–xvi. Bruxelles, 1862–77. 8vo. Histoire politique et militaire de Belgique, par M. B. Renard. vol. i, parts 1 and 2. Bruxelles, 1847–51. 8vo. Trésor national. vols. i–iv. Second series. i–iv. Bruxelles, 1842–44. 8vo. Lectures relatives à l'histoire des sciences, des arts, des lettres, des mœurs et de la politique en Belgique, par F. V. Goethals. vols. i–iv. Bruxelles, 1837–38. 8vo. Le procès du comte d'Egmont, par M. De Bavay. Bruxelles, 1853. 8vo. Études sur les constitutions nationales, par C. Faider. Bruxelles, 1842. 8vo. Le socialisme depuis l'antiquité jusqu'à la constitution française du 14 janvier 1842, par J. J. Thomissen. vols. i–ii. Louvain, 1852. 8vo. Documents sur le système des assurances par l'état. Tome i–ii. Bruxelles, 1847–49. 4to. Canaux et rivières de la Belgique, par B. L. De Rive. Bruxelles, 1835. 8vo. Histoire de la ville de Gand, par L. A. Warnkönig. Bruxelles, 1846. 8vo. Revue de l'instruction publique en Belgique. 1858–77. Bruges and Gand. 8vo. (20 volumes.) Bulletin de la Commission centrale de statistique belge. Tome i–xii. Bruxelles, 1843–72. 4to. Revue d'histoire et d'archéologie. vols. i–iv. Bruxelles, 1859–64. 8vo. Etudes sur Salluste, par C. C. de Gerlache. Bruxelles, 1847. 8vo. Études politiques sur l'histoire ancienne et moderne, par Paul Devaux. Bruxelles, 1875. 8vo. Bulletin and Annales de la Société belge de microscopie. vols. i–ii. Bruxelles, 1875–76. 8vo. Œuvres complètes de J. J. Raepsaet. vols. i–vi, and notice nécrologique. Gand. 1838–41. 8vo. Des voies navigables en Belgique. Bruxelles, 1842. Folio. Bibliographie de Belgique. vols. i–iii. 1875–77. Bruxelles. 8vo. Actes des états généraux de 1600–32. Bruxelles, 1849–66. 4to. (3 vols.)

From the Société de médecine, Marseille: Bulletin des travaux. Années i–xii. 1857–68. Marseille. 8vo. Marseille médical. 1869–78. Marseille. 8vo. 115 parts.

From the National Institute of France, Paris: Mémoires de l'Académie des sciences. vols. xxxviii, xxxix, xl. Paris, 1873–77. 4to. Comptes-rendus des séances de l'Académie des sciences. vols. lxxi–lxxxvi. Paris. 4to. 1871–78. Annuaire, 1865–79. 8vo. (13 vols.) Mémoires de l'Académie des inscriptions et belles-lettres. 8 parts. Paris. 1871–78 4to. Notices et extraits de manuscrits de la bibliothèque nationale, etc. vols. xv–xxii, i; xxiii; xxiv, ii; xxvi, ii; xxvii, ii; xxviii, ii. Paris, 1870–78. 4to. Recueil des discours, rapports et pièces diverses. 1860–69–70–79. Paris. 4to. Recueil des mémoires, rapports, etc., relatifs à l'observation du passage de Vénus sur le soleil. T. i, ii, i. Paris, 1876–78. 4to. And 40 pamphlets.

From the Academy of Montpellier, Faculty of Medicine: Thèses. 1876–77–78. Montpellier. 4to. (9 vols. and 158 parts.)

From the Royal Danish Academy of Sciences, Copenhagen: Nye Samling af det kongelige Danske videnskabers Selskabs Skrifter. vols. i–v. Copenhagen, 1871–1799. 4to. Det kongelige Danske Videnskabernes Selskabs Skrifter. Naturv. og Malhem. Afd. viii, 3, 4, 5. x, 3–6, xii, 3. 1869–78. Historisk og Philos. Afd. iv, 1–3, 5, 6, 10. 1868–73. Copenhagen. 4to. Oversigt over det Kgl. Danske Videnskabernes Selskabs Forhandlinger. 1870, 3; 1873, 1874, 1. Copenhagen. 8vo. Description de la Cathédrale de Ribe en Jutland, par Jacob Helms. Année xvi. Plumes lithographiques. Copenhagen, 1870. Folio. Roskilde Domkirke Beo-Kreveu, af J. Kornerup. Med 24 lithographerede, og Chemity Tauler. Copenhagen, 1877. Folio.

From the Turkish Government, Constantinople: "Destour," or collection of the laws and regulations of the empire. 6 vols. 8vo. "Saluame," or official annuary. 8vo. (In Turkish.)

From the Hellenic Philological Society, Constantinople: Publications. 1871–79. Constantinople. 8vo. 9 vols, in Greek.

From the Von Malzan Natural History Museum, Waren, Mecklenburg-Schwerin: Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg. Years i–xxx. Neubrandenburg, 1847–76. 8vo. And 21 natural-history pamphlets.

From Daniel Oehlert, Laval: Traité des maladies chirurgicales, par le Baron Boyer. vols. i–xi. Paris, 1814–22. 8vo. Nosographie chirurgicale, ou nouveaux élémens de pathologie, par M. le Chevalier Richerand. vols. i–iv. Paris, 1815. 8vo. Nouveaux élémens de physiologie, par A. Richerand. vols. i, ii. Paris, 1814. 8vo. Nouveaux élémens de thérapeutique et de matière médicale, par J. L. Alibert. Paris, 1877. 8vo. Concours d'animaux réproducteurs, etc., 1857, 1860, 1862. Paris, 1859–66. 8vo. Enquête agricole. Deuxième série. Enquêtes départementale. 2^e circonscription. Paris, 1867. 4to. (2 copies.) Agriculture française, par MM. les inspecteurs de l'agriculture. 6 vols. Paris, 1843–47. 8vo. Thomæ Sydenham. Opera medica. vols. i, ii. Geneva, 1757. small 4to. Rapports au ministre sur la collection des documents inédits de l'histoire de France. Paris, 1874. 4to. Rapport sur l'Exposition universelle de 1855. Paris, 1857. 8vo. Rapport général sur les travaux du conseil d'hygiène publique et de salubrité du département de la Seine, 1849–58. Paris, 1861. 4to. Leçons de médecine légale, par M. Orfila. 3 vols. Paris, 1821–23. 8vo. Travaux du conseil d'hygiène publique et de salubrité du département de la Gironde. Tome xx. Bordeaux, 1879. 8vo. Bulletin de la Société de l'industrie de La Mayenne. vols. i–iv. Laval, 1853–68. 8vo. Rapport sur l'asile de La Roche Gandon, 1869, 1870, 1873, 1874, 1875. Mayenne, 1870–76. 8vo. Traité d'assainissement industriel, par C. de Freycinet. Paris, 1870. 8vo. L'Agriculture allemande, par Royer. Paris, 1847. 8vo. Documents statistiques concernant le choléra en 1854. Paris, 1862. 4to. Théorie nouvelle concernant les maladies concéreuses, etc., par J. M. Gamet. i, ii. Paris, 1772. 8vo. Bulletin de la Société d'agriculture de Mayenne, 1859–68. Mayenne. 8vo. And 22 pamphlets.

From the Magnetical and Meteorological Observatory, Zi-ka-wei, China: Cursus litteraturæ Sinicæ. vols. i, ii. Changhei, 1879. 8vo. L'infanticide et l'œuvre de la saint-enfance en Chine. Changhei, 1878. 4to. And 84 volumes of theological works, written in Chinese, and published by the Catholic mission of Kiangnan.

CORRESPONDENCE.

In the report of 1878, under this head, an explanation was given as to the causes of the large increase in the correspondence during that year. This statement will apply also to the period of 1879, with the exception that, while letters of condolence on account of the death of Professor Henry have necessarily been fewer, the number of communications relative to exchanges has exceeded that of any previous year, the increase in this direction being largely due to renewed activity in that department of the Institution, and especially in the international branch of the system.

CO-OPERATION OF THE GOVERNMENT DEPARTMENTS.

Very important service has been rendered to the Smithsonian Institution, and to the National Museum under its charge, by an order from the Secretary of War authorizing the use of the Quartermaster's Department in the transportation of collections, &c. As many of these come from regions where there is no established mode of transportation, the benefit of this arrangement promises to be very great, and under it quite a number of boxes have been already transferred to Washington.

CO-OPERATION OF THE INSTITUTION IN THE WORK OF OTHERS.

In previous years requests have frequently been received from foreign governments, especially those of Japan and China, and of Central and South America, for the selection of persons to carry on certain operations, particularly those relating to engineering and mining geology, nearly every year bringing at least one call of this character. To this the year 1879 furnished no exception, the Government of Salvador, through the American minister, Mr. George Williamson, having asked to be supplied with an experienced geologist to explore the recently discovered gold fields of the state. Of course in such cases the advice of experts is always solicited, and several of these uniting on the name of Mr. Goodyear, a resident of California, and formerly connected with the geological survey of that State, he was selected for the mission in question, and has already entered upon his duties.

Communication from the Belgian Government in regard to a prize for the improvement of Belgian harbors.—On the 27th of December, 1879, the following communication was received from the chargé d'affaires of Belgium:

[Translation.]

"BELGIAN LEGATION,
"*Washington, December* 27, 1879.

"SIR: Inclosed in a communication dated March 29, 1875, Mr. Delfosse, the Belgian minister at Washington, transmitted to Prof. Joseph Henry a copy of a royal decree of December 14, 1874, instituting an annual prize of 25,000 francs for the purpose of encouraging intellectual labors in Belgium, and to induce foreigners to take part in this movement.

"According to the terms of article 12 of this decree, the prize to be contested for in an international competition will be awarded in 1881 *for the best paper on the means of improving harbors situated on low and sandy coasts like those of Belgium.*

"The government desires again to call the attention of foreigners to this subject, inviting them to compete with Belgian authors. To this end I shall be obliged to you if you will have a translation of the inclosed notice published in the annual report of the Smithsonian Institution, or in any other manner you may see fit, to insure it the greatest possible publicity in the United States.

"Accept, sir, the assurance of my most distinguished considerations.

"GEO. NEYT,
"*Chargé d'Affaires of Belgium.*

"Prof. SPENCER F. BAIRD,
"*Secretary Smithsonian Institution, Washington, D. C.*"

"NOTICE.—By a decree of December 14, 1874, His Majesty the King of the Belgians has instituted an annual prize of 25,000 francs ($5,000) for the purpose of encouraging intellectual labors.

"The prize to be contested for in an international competition will be awarded in 1881 *for the best paper on the means of improving harbors situated on low and sandy coasts like those of Belgium.*

"Foreigners desiring to take part in the competition should send their papers, printed or manuscript, before the 1st of January, 1881, to the minister of the interior at Brussels.

"The manuscript which will receive the prize will be published in the course of the year following that in which the award will have been made.

"The latter is to be made by a jury appointed by the King of the Belgians. This jury will be composed of seven members, three Belgians and four foreigners of different nationalities."

In reply Mr. Neyt was informed that his letter would be published in the current report of the Institution, as being the place most likely to attract the attention of persons interested in the offer of a prize, and the fact that it was open to international competition.

Centennial Commission.—An application was received during the year from the executive council of the International Exhibition of 1876 to take charge of the archives of the exhibition, believed to be of great historical importance and value, and the permanent preservation of which is considered a matter of much importance. It is accordingly proposed to devote one of the fire-proof rooms in the new National Museum to that purpose; this being especially appropriate, since the building itself was erected to receive the exhibition of the United States made at Philadelphia, as also the large mass of donations of objects of art, industry, and economy presented to the United States by foreign nations.

Armenian History.—The Institution has received from the Archbishop of Trajanof, and general abbot of the Armenian Mekitrarian Institution of Venice, the following letter, dated November 11, 1879:

"Knowing the interest taken by your Institution in the diffusion of knowledge throughout the world, of which we have continued proofs in the gifts of books with which we are honored by you, I have the honor to submit to your kindness the following request:

"Considering the want of education of the eastern nations, who now, by new political conditions, awake to a new life of progress, and considering also their scanty means of partaking of all those benefits which are the enjoyment of civilized nations, especially in these years of great poverty, we have undertaken to procure means by which we might publish and distribute gratuitously useful books of general and popular knowledge. As this, our object, involves great expense, we hope that the societies of the Old and New Worlds will hasten to our assistance. We have already prepared in our monastery, in the Armenian language, a large work on Armenia, comprising a description connected with ancient and modern history of its towns, villages, public establishments, monuments, churches, monasteries, &c., a complete work which we hope will be very interesting, not only to Armenian scholars, but also to such orientalists as make a particular study of the old history of eastern nations. We are about to begin its publication, which will be with many maps and illustrations. This will be a difficult task, especially at this time; wherefore we hope that your Institution will feel the interest of such work and generously help us to publish it worthily."

Manitoba Library.—The Institution has been informed of the organization of the "Historical and Scientific Society of Manitoba," at Winnipeg, Manitoba, Canada, for the purpose of collecting a library of books, a cabinet and museum, &c., generally illustrative of the civil, religious, literary, and natural history of the lands and territories lying to the west and north of Lake Superior. Aid has been solicited in carrying out these objects by the donation of books and specimens, and the attention of the correspondents of the Institution is especially called to this request.

Zoölogical Society of London.—The services of the Smithsonian Institution were invoked by this Society to assist it in procuring some specimens of American mule deer (*Cervus macrotis*) two males and three females being desired. The commission was intrusted to the Hon. J. D. Caton, of Ottawa, Ill., a gentleman who is better acquainted with the American ruminants, deer, antelope, &c., than any other person, and who has written an admirable treatise upon them. Judge Caton was able to secure a fine specimen in his neighborhood, which was transmitted to the Central Park Menagerie, New York, for safe keeping, Mr. W. A. Conklin, the superintendent, very kindly agreeing to receive and ship anything of the kind which might be sent to him for the purpose. Messrs. Henderson & Co., the agents of the Anchor Line of steamers to Great Britain, with their usual liberality, offered to forward this animal free of charge; and it was consequently shipped per steamer Victoria on the 26th of February.

GALLERY OF ART.

It was not deemed desirable by my predecessor that there should be any antagonism of interests by the duplication of collections in the different departments in Washington, and an arrangement was made, many years ago, by which all specimens of plants and matters derived from the vegetable kingdom, as well as all insects, were to be placed in charge of the Department of Agriculture, and everything relating to the human subject, such as crania, pathological preparations, &c., in that of the Army Medical Museum. These establishments, in return, were to deliver to the Institution all animals, minerals, and articles of ethnology or archæology received by them. This arrangement has been maintained, to mutual advantage. In a similar manner it was proposed to deposit acceptable works of art in the Corcoran Art Gallery, and quite a number of articles have already been placed there. During the past year the following deposits have been made. It is, of course, understood that these are not gifts but simply loans, to be returned whenever occasion requires.

List of articles transferred from the Smithsonian Institution to the Corcoran Art Gallery in 1879.

Museum No.		
34776.	Female sitting, with two infants	Plaster cast.
34777.	Equestrian statue, Andrew Jackson	Model.
34778.	Bust of Col. Peter Force	Plaster cast.
34779.	Bust of Hon. Dixon H. Lewis	Plaster cast.
34780.	Medallion of William Wilson	Plaster cast.
34781.	Statue of the Venus de Medici	Plaster cast.
34782.	Female recumbent, with a lamb	Model.
34783.	Female, nude, half rising	Model.
34784.	Two females, standing	Model.
34785.	Do	Model.
34786.	Sleeping child	Model.
34787.	Marble medallion, Bacchante	Marble.
34788.	Female bust, wife of Ferdinand Pettrich	Plaster cast.
34789.	Bust of son of Ferdinand Pettrich	Plaster cast.
34790.	Statuette, Duke of Orleans	Plaster cast.
34791.	Statuette, Daniel O'Connell	Plaster cast.
34792.	Bust, bronzed, of Baron Cuvier	Plaster cast.
34793.	Bust of George Washington	Plaster cast.
34794.	Six small busts of F. Pettrich's children	Plaster cast.
34795.	Statuette, boy holding a ewer	Plaster cast.
34796.	Female crouching	Plaster cast.
34797.	Nude figure, "The hunter," with birds or game	Plaster cast.
34798.	Bust of LeClear	Plaster cast.
34799.	Bust of Laplace	Plaster cast.
34800.	Bust of Ferdinand Pettrich	Plaster cast.
34801.	Bust of Gustav Adolph Pettrich	Plaster cast.
34802.	Bust of Dr. Kane	Plaster cast.
34803.	Bust of Benjamin Hallowell	Plaster cast.
34804.	Nelson monument in London, model	Wood, &c.

BUILDINGS.

Smithsonian Building.—Many of the original plans of this building were either lost or greatly defaced in the fire of 1865, and it was thought desirable to have new drawings made to exhibit the details of the edifice, especially as the interior contruction had been considerably altered: first, in consequence of the falling down of the central part while in process of erection; and, second, as a consequence of the repairs required by the fire of 1865. These drawings have been carefully executed by Mr. Gorham, and, after being photographed, the originals have been deposited in a fire-proof safe. Upon these drawings have been plotted all the pipes connected with the water, gas, and steam apparatus, with the various stops and connections.

New Yale locks have been applied to all the rooms throughout the building, and so arranged that while persons occupying a room, or suite of rooms, are provided with keys that will open them only, a single pass-key opens every door in the building; this, of course, being held only by the proper authority.

Other alterations have been made in the building for the purpose of increasing to the utmost its efficiency and reducing the expense of superintendence and maintenance. The document room has been enlarged, by the removal of numerous obstructions, and refitted. The eastern wing of the building, formerly occupied by Professor Henry as a dwelling-house, has been converted into a series of offices, and a door cut from the old document room to an adjacent apartment, which is now used for the reception and classification of a portion of the exchanges.

Eleven large fire-proof doors have been placed in the building to isolate the different wings and floors.

The laboratory has been rearranged and many other improvements have been made. These were commenced late in the autumn of 1878 and finished in the spring of 1879. It is believed that the building is now in a condition of thorough efficiency and adaptation to its scientific purposes.

Art building and laboratory.—The provision by Congress for an exhibition by the United States Government at the Centennial Exposition, at Philadelphia, in 1876, made it necessary for the Smithsonian Institution to construct a special building for the purpose of preparing its share of the display, and a small edifice was accordingly erected on the grounds for the purpose of giving increased accommodation to the modelers, artists, and photographer. This building has been in use for nearly five years, and has rendered excellent service by the facilities it has afforded. It is, however, now inadequate to its object, and in the new museum building, provision has been made for the various departments referred to. Some suitable occupation will be found for the old building.

Armory building.—Another building in charge of the Smithsonian Institution is that formerly occupied as an armory by the militia of the District of Columbia, but which, ceasing to discharge that function, was placed by Congress in the care of the Institution for the storage of its material which could not be received in the present edifice. This armory building, the dimensions of which are one hundred feet by fifty, is very massive in construction and contains four floors, at present entirely filled with boxes containing the Centennial collections which are to constitute the material for exhibition in the new National Museum building.

The surveys of Professors Hayden and Powell having been discontinued by order of Congress, a portion of the public property belonging to them has been stored in the Armory building and Smithsonian Institution during the past year, Mr. King, the director of the new geological survey, making use of such of these materials as he requires.

SPECIAL DONATIONS.

Among the contributions or donations to the Institution, during the year, are several that do not belong directly under the head of natural history, but of which mention should be made.

Mr. F. B. Sanborn, agent of the Hydropneumatic Fire Extinguishing Company, presented to the Institution a specimen of his apparatus in working order. This has been placed where it will be most available in the very undesirable contingency of a fire in the building.

The Herring Fire-proof Safe Company, of New York, some months ago intimated its willingness to present to the Institution a first-class specimen of its work, and, as among the specimens in the National Museum are some masses of native gold, precious stones, and other valuable property, it was thought best to request that the offer be supplied in the form of a safe suitable for exhibiting such objects.

A plan of a safe was accordingly prepared with doors on opposite sides and when opened revealing series of glass shelves, inclosed and secured by plate glass fronts; the whole apparatus to be seven feet high, four feet wide, and two feet deep. This was put under construction by the company, has been completed, and is now ready for transmission to Washington whenever called for. It is proposed to use this as part of the fixtures of the new National Museum.

Another contribution of a somewhat similar character was made to the Institution by the Yale Lock Company, who constructed and presented a post-office box for the use of the employés. In addition to the clerks and assistants of the Smithsonian Institution and National Museum, there are a number of gentlemen having rooms in the building, who, although receiving no salary, render important service in the supervision of collections and identification of specimens. Nearly all these persons receive their mail at the Institution, and it has heretofore been difficult to properly subdivide and place such matter in the hands of those for whom it was destined. Under the new arrangement each individual now has his own box, with a key which alone will open it, and the mail as received is properly assorted in the boxes. This post-office box constitutes quite an ornamental piece of furniture, and supplies the desired accommodations.

MEETINGS, ETC.

National Academy of Sciences.—For several years after its organization the annual meetings of the National Academy of Sciences were held at the Smithsonian Institution, although, even with the limited number usually attending, it was difficult to furnish the necessary accommodations. In view of the increasing number of members of the academy, and of the visitors attending the reading of papers, it was concluded to make other arrangements for 1879, and, accordingly, the pastor and vestry of All Souls' Church having kindly consented to grant the use of their new and very convenient edifice for the purpose, the meeting was held therein on the 14th–18th of April, 1879, the accommodations being entirely satisfactory. A similar favor will probably be asked of the church for 1880; but it is thought that with the completion of the new National Museum building a suitable room can be furnished in it by 1881, so that the academy will again have its headquarters under the auspices of the Smithsonian Institution.

Anthropological Society of Washington.—An Anthropological Society has lately been organized in the District of Columbia for the purpose of bringing together those especially interested in the study of man, and the use of a room in the Institution was cheerfully accorded, on its application. Here meetings are regularly held every other week throughout the year, and the large and increasing attendance shows the appreciation of the subject in Washington. No similar American society appears to be in a more flourishing condition or more earnest in its investigations.

Lectures.—The Regents' room was also accorded to Prof. C. S. Hastings, of the Johns Hopkins University, for a special course of lectures on astronomical physics. This was attended by the gentlemen connected with the Observatory, Nautical Almanac, Coast Survey, and other scientific establishments in the city.

LOSS OF EMPLOYÉS AND COLLABORATORS.

It is proper to mention the sudden death, by apoplexy, of Mr. Tobias N. Woltz, on the 9th day of March. He had been connected with the Institution, as master mechanic and superintendent of the building for twenty-two years; was always diligent, industrious, and faithful, and, as he left nothing to his family, I would recommend that, on account of his long and useful services to the Institution, an allowance be made for his funeral expenses.

The report for 1877 contained a notice of the death of Mr. Fielding B. Meek, a gentleman who, although not salaried by the Institution, made the building his home for many years, while engaged in his specialty, as a paleontologist, with the government surveys. Mr. Meek died intestate, and letters of administration were granted to Professor Henry upon his property. Diligent search was made in various directions for several years for heirs, but without success. Lately, however, a distant relative has appeared to claim the estate, and the matter is now before the courts.

The library and notes of Mr. Meek were purchased by the Institution to secure them for the use of paleontological students.

Among the collaborators of the Institution whose death has occurred during the past year is Dr. JAMES AITKEN MEIGS, of Philadelphia. He was born in Philadelphia on the 31st of July, 1829, received his education in the public schools of that city, graduated at the Jefferson Medical College in 1851, and devoted himself with zeal and energy to the practice of his profession. He was professor of climatology and physiology at the Franklin Institute for eight years, and during this period lectured frequently on physiological and ethnological subjects before various associations in our prominent cities.

In 1857 he accepted the chair of institutes of medicine in the Philadelphia College of Medicine; and was, after a few years, transferred to the Pennsylvania College. His lectures on physiology attracted much attention, as no sustained systematic attempt to teach physiology experimentally had been made before in either of the four medical schools then existing in Philadelphia. In 1868 he was elected to the Jefferson Medical College to succeed the late Prof. Robley Dunglison, on the recommendation of the highest medical authorities in this country and Europe. He was an active member of the leading scientific societies; contributed numerous and valuable papers to medical and other journals. He arranged and classified the extensive collection of human crania in the Academy of Natural Sciences, and prepared a systematic catalogue of the collection. He also devoted much time to physiological and ethnological researches, and in all his relations in life was eminent for purity of character, clearness and vigor of intellect, and ardor alike in the pursuit of knowledge and imparting instruction to others. He died in Philadelphia on the 9th of November, 1879.

NATIONAL MUSEUM.

The act of Congress of 1846, establishing the Smithsonian Institution, placed under its charge, in proportion as suitable arrangements could be made for their reception, all objects of natural history, mineralogy, and geology, antiquities, &c., belonging to the United States. At the time of the passage of the act the government collections consisted essentially of the objects gathered by the celebrated exploring expedition of Capt. Charles Wilkes, which even to the present time has been by far the most extensive and exhaustive enterprise of its kind conducted by any government. Its results would have been very much larger but for the loss of one of the vessels, the "Peacock," off the mouth of the Columbia River. In this were contained an immense number of articles from the islands of the Pacific Ocean and from the coast of Oregon and California.

The objects brought back to Washington were placed in charge of the Commissioner of Patents, and an appropriation was made regularly by Congress for their maintenance and superintendence.

In 1856 the completion of the central part of the Smithsonian building and the need by the Patent Office of the space in its building occupied by the collections of the Wilkes' expedition, brought about an arrangement between the Committee on Patents in the House of Representatives and the Regents of the Smithsonian Institution, by which the latter agreed to accept the custody of the collections, on condition that the necessary appropriations for their maintenance in the Smithsonian building should be continued by Congress, to include also the expense of the construction of cases and other requirements. This was carried into effect, and in 1857 the government collections were transferred; since which time they have been in the custody of the Institution. Prior to that date, however, large numbers of government and other specimens had been received and cared for at the Smithsonian Institution, but not displayed. These, with the Wilkes' collection and a few others received with them, may be considered as marking the beginning of the National Museum.

The institution now points with great satisfaction to the progress that has been accomplished in about twenty-two years, at the end of which time one of the largest and best appointed collections of natural history and ethnology extant has been developed.

INCREASE OF THE MUSEUM.

Coming now to the consideration of the condition and history of the National Museum for the year 1879, and beginning with its increase, the general nature of the additions to the Museum during the year will be readily gathered by reference to the alphabetical list of donations and the memoranda in regard to explorations. It may be noted that the donations in 1879 very greatly exceeded those of any previous year, amounting to 1,173 separate entries, while those of 1878 were 1,075. A large portion of the number consists of contributions made by the fishing vessels of Gloucester, Mass., as referred to more particularly under the head of operations of the United States Fish Commission. The additions to the Museum are derived from four principal sources, viz: 1. Government exploring and surveying parties. 2. Explorations and researches of the Smithsonian Institution. 3. Miscellaneous contributions. 4. By exchanges of specimens. A fifth element of increase in most museums is by purchase. This, however, amounts to very little in the case of the National Museum, and is for the most part confined to an occasional specimen of archæology needed to fill a gap.

As the Institution has not been hitherto prepared to undertake the gathering of universal collections, but has confined its efforts more particularly to the representation of the animal and mineral kingdom of the New World, there has been less opportunity to increase its display by exchanges, while its own collections from government expeditions and by contributions of its correspondents covered the greater part of what is absolutely desired. The opportunity of extensive exchanges is still open, however, and may possibly be resorted to hereafter.

Among the more important collaborators in the way of exchanges may be mentioned the educational authorities of Japan, who have placed the National Museum under direct obligations by the transmission of well-arranged and preserved collections of the natural history of that country. The most important of these is a series of the fishes, partly preserved in alcohol and partly dried. These came in excellent condition and has been accurately identified by Japanese naturalists attached to the Museum. Already over two hundred species have been furnished, constituting an extremely valuable means of investigating the fishes of the North Pacific coast. Their particular importance is in their relationship in illustration of the ichthyology of the waters of the western coast of the United States.

These specimens were furnished by the Mombusho or Educational Museum of Tokio, which has also supplied a large series of minerals and rocks of the country.

A very valuable collection of the fishes of Norway was presented to the Institution by the University of Christiania, as prepared by Professor Esimark, at the request of Mr. Robert Collett, a correspondent of the Institution. These are particularly acceptable as furnishing the means of comparison with the many species obtained from the off-shore fishing-grounds by American fishermen.

From the National Museum of the City of Mexico some very interesting articles have been received in exchange, principally of an archæological character.

An important exchange of birds with the American Museum of Natural History in New York will be found mentioned further on.

The additions to the museum from the operations of government parties, or those fitted out in whole or in part by the Smithsonian Institution, will be found in a brief mention under the head of Explorations. The details, as also those of the miscellaneous contributions, are given in the alphabetical list of donors and their donations.

Mammals.—The collections of mammals sent by Mr. Turner and Mr. Nelson, from Alaska, and by Lieutenant Wheeler, of the Engineers, from Colorado, &c., are most important.

Birds.—Of birds, an extremely valuable donation of 295 species and 318 specimens was made by the American Museum of Natural History in New York; these being for the most part either specimens not represented in the National Museum or in better condition than any it had been able to procure. A suitable return will be made in duplicate birds and other objects.

The collections of birds made by Mr. Nelson and Mr. Turner, already referred to under the head of Explorations, are of very great interest, embracing, as they do, large numbers of excellent specimens.

Lieutenant Wheeler is also to be mentioned in this series for his deposit of many valuable skins beautifully prepared by Mr. Henshaw, constituting part of the collections of the United States Geographical Survey of the One-hundreth Meridian.

The birds collected by Mr. Ridgway at Cobb's Island, mentioned under the head of explorations, were also of much value.

Some specimens were collected on the Grand Banks by the fishermen, and by Messrs. Osborne and Scudder, which are also noteworthy.

Several rare specimens of Texas birds were obtained by Mr. Ragsdale.

Reptiles.—A miscellaneous collection of reptiles was received from various sources, more especially of living serpents, salamanders, turtles, and lizards, from many different contributors. These came in part from Mr. Frank W. Hayward, of South Carolina, Mr. S. T. Walker, of Florida, Dr. Lightburne, of Fort Mohave, and many others, and have served a most admirable purpose for making the series of plaster casts of American reptiles, which is superior in interest and extent to anything extant in public museums at home or abroad.

To Mr. Edward Newton, colonial secretary of Jamaica, we owe a living specimen of the yellow boa, a rare serpent of great size, of which admirable copies have been made.

Fishes.—The collections in this department, as might be expected, from the relations of the United States Fish Commission to the Smithsonian Institution, have included many new and rare species from the Atlantic and Pacific Oceans, the Gulf of Mexico, the lakes, and the interior waters. The amount of the collections is entirely too great to attempt a specification, although among the most important may be mentioned a series furnished by the Museum of the University of Christiania of seventy-one species of Norwegian fishes, and the collection from Japan, from the Mombusho Museum, already referred to under the head of Exchanges.

To Mr. E. G. Blackford, the enterprising fish-dealer of Fulton Market, New York, the Institution has for years been under many obligations for his zeal in collecting all the rare fishes that came to the New York market, and forwarding such of them to the Institution as he had reason to believe were desirable. Many new species, and others of great rarity have been thus selected by Mr. Blackford, who has also rendered most important service in receiving various consignments of fish packed in ice from various parts of the country and even from Europe, and in repacking and forwarding them to Washington.

To the masters and crews of the Gloucester fishing-fleet most special acknowledgments are due for their earnest desire to place at the command of the government the means of information in regard to the fields of labor traversed by them. A full statement of these contributions will be found in the list of donations to the United States Fish Commission.

The United States Fish Commission itself was stationed at Provincetown, Mass., during the last summer, and secured great numbers of fishes.

Marine invertebrates.—Of marine invertebrates, by far the most important collections are those furnished by the Gloucester fishing-fleet, referred to under the head of Fishes, and by the United States Fish Commission at Provincetown.

The labors of Dr. White in the Northern Pacific also resulted in an important contribution.

Insects.—No extensive collections of insects came to hand during the year; perhaps the most important being that from Central Mexico, furnished by Professor Dugés. These, as before, have been sent to the United States Agricultural Department.

Plants.—Various packages of plants, of no great importance, have been received during the year, and, like the insects, have been transferred to the Department of Agriculture.

Minerals.—Many important collections of minerals, geological specimens, &c., have been received during the year; a valuable contribution being that already referred to, as sent by the Mombusho Museum of Japan, consisting of what professes to be a complete series of the minerals and rocks of that country.

Mr. Thomas Donaldson, a member of the United States Land Commission, while visiting the West in connection with his duties, made a large collection of minerals and ores from Leadville, Deadwood, and other parts of the country; the whole filling some fifteen large boxes. This collection constitutes a very desirable supplement to the immense series of a similar character gathered by him at the request of the Smithsonian Institution in 1874, 1875, and 1876, constituting the larger part of the great display of the mineral wealth of the country made under the auspices of the Institution in the government building at the International Exhibition of 1876.

PRESENT CONDITION OF THE MUSEUM.

The administration of the Museum by the various assistants employed during the year has been entirely satisfactory. The work has been under the special charge of Mr. G. Brown Goode, having as collaborators: Dr. Charles Rau, Dr. E. Foreman, and Mr. F. H. Cushing, for the department of anthropology; Dr. F. M. Endlich, curator of mineralogy; Mr. Robert Ridgway, curator of ornithology; Dr. T. H. Bean, curator of ichthyology; Dr. H. C. Yarrow, assisted by Mr. S. C. Brown, curator of herpetology; Dr. Elliott Coues, curator of mammalogy; Mr. William H. Dall, curator of marine and aquatic invertebrates. Mr. Dall, Dr. Coues, and Dr. Yarrow performed their services without any compensation.

All the collections, as received, have been properly treated for preservation from destruction by insects or otherwise, and entered in the several record books; the total number of entries for the year 1879 being 11,552.

The distribution of duplicate specimens, already referred to, has also been carried on on a large scale. The details will be found in the appended tables.

As usual, the material of the institution has been made use of by experts and specialists for the prosecution of their researches. Although it is most convenient to have this done at the institution, yet wherever the interest of science requires it, collections are sent to any part of the world.

Among the more important of these researches are those of Mr. George N. Lawrence, Mr. Ridgway, and Dr. Coues, upon American birds; of Mr. J. A. Allen, of Cambridge, upon the mammals; of Professor Gill, Mr. Goode, Dr. Bean, and Professor Jordan, upon the fishes; and Prof. Edward D. Cope, upon the reptiles.

The marine invertebrates collected by the United States Fish Commission are in process of investigation by Prof. A. E. Verrill, assisted by Mr. Oscar Harger, Mr. Sanderson Smith, Prof. S. J. Smith, and Mr. R. Rathbun.

A series of skulls and skeletons of the Central American tapir was sent to Mr. Edward Alston, of London, for a critical examination. By such assignments, facts of more or less importance can be obtained; and it is in this way that the Institution best carries out the will of its founder for "the increase and diffusion of knowledge among men."

An immense mass of duplicate material belonging to the National Museum has been used in the way of a distribution of an educational series of objects to various colleges, academies, and learned societies of the United States, special provision having been made for the same by act of Congress.

NEW MUSEUM BUILDING.

For a detailed account of the measures taken to secure additional accommodations for the collections belonging to the National Museum, especially those gathered for the Philadelphia Exhibition and obtained from other parties at its close, reference is made to the reports of 1876, 1877, and 1878. It will here be sufficient to say that after several fruitless efforts, Congress, in the sundry civil bill of March 3, 1879, made an appropriation for a National Museum, in the following terms:

"For a fire-proof building for the use of the National Museum, three hundred feet square, to be erected under the direction and supervision of the Regents of the Smithsonian Institution, in accordance with the plans now on file with the Joint Committee of Public Buildings and Grounds, on the southeastern portion of the grounds of the Smithsonian Institution, two hundred and fifty thousand dollars; said building to be placed east of the Smithsonian Institution, leaving a roadway between it and the latter of not less than fifty feet, with its north front on a line with the south face of the buildings of the Agricultural Department and of the Smithsonian Institution; and all expenditures for the purposes herein mentioned, not including anything for architectural plans, shall be audited by the proper officers of the Treasury Department."

The estimates had been furnished by Messrs. Cluss & Schulze, consulting architects, as to the cost of such a building, and upon their representations the sum of $250,000 was asked for and granted, with the understanding that it would be sufficient for its purpose, although no limitation to that effect was made by Congress. As soon as possible after the passage of the act, the whole subject was carefully reviewed, and the accuracy of the estimates confirmed by Mr. Edward Clark, Architect of the Capitol, and General M. C. Meigs, of the Army. Contracts were then entered into, and as labor and material were at the time at the very lowest figures, several of the estimates were found to be greater than the amount of the contract entered into. Owing to the exceptionally moderate winter and the freedom from rain and storms, only fourteen days were lost during the year by non-preventable causes. For a full report of the details connected with the construction of the building reference may be made to the report of the National Museum Building Commission, herewith communicated. There is every reason to believe that the whole work will be accomplished within the appropriation, by June next.

No provision was made in the appropriation by Congress for the construction of the necessary cases, but an estimate has been presented, which it is hoped will be granted, so that this work may be started with the beginning of the next fiscal year. The period of complete installation of collections on hand, and the opening of the building to the public, will depend upon the amount of the appropriation and the rapidity with which the contractors may complete their work. The new building will be devoted more particularly to industrial exhibits, intended to show the animal and mineral resources of the United States and their practical applications to the wants or luxuries of man. The department of anthropology will also be largely represented. How far natural history can find a place in the building will depend upon the space required for the collections mentioned. It is confidently expected that this building when finished will be one of the most attractive objects of the kind extant, and but little inferior to the celebrated museums of foreign countries.

UNITED STATES FISH COMMISSION.

Reference has been made in many previous reports to the part taken by the United States Fish Commission in the investigation of the condition of the sea fisheries and in the propagation of food-fishes in the United States, your Secretary having been appointed by the President, in 1871, to the duty of carrying out the objects designated by a law of Congress in the same year. Serving without any compensation and receiving simply his own board and necessary personal expenses while actually engaged in the work, he has been obliged, in the increasing extent of his Fish Commission work, to devote to it more and more of the hours that would be usually allowed for leisure and recreation, his prime duty being, of course, to the Smithsonian Institution.

The work of the Commission is divided into two branches: First, an inquiry into the condition of the fisheries on the Atlantic and Pacific and Great Lake coasts; and second, the propagation of useful food-fishes

Under the head of "inquiry" the summers of successive years have been spent at various stations from the Bay of Fundy to Long Island Sound, and the information obtained has been published in the annual reports of the Fish Commission. The information obtained by this commission was of great importance to the United States Government at the Halifax convention.

For the work of 1879, Provincetown, at the extreme end of Cape Cod, was selected as the central station, and with the assistance of the steamer "Speedwell," under the command of Capt. Z. L. Tanner, a successful investigation was prosecuted in regard to the natural history and physics of the adjacent seas. The steamer, with its crew, were furnished by Hon. R. W. Thompson, Secretary of the Navy, in accordance with the law of Congress to that effect. It may not be out of place to mention in this connection that of the departments of the government that of the Navy has been especially liberal in its construction of the law, and has rendered the greatest possible aid in the work of the Commission.

The labors of the commission in 1879 were made directly conducive to the success of the efforts in connection with the census, as already referred to.

An incident of the summer's work was, as before, the collection of vast numbers of specimens of marine animals, a full series of which will be reserved for the National Museum, and the duplicates arranged for distribution to various educational establishments throughout the country. At the present time, of all the means of instruction in general natural history—a subject attracting much attention in schools and colleges—there are none more difficult to obtain than objects illustrating the botany and zoology of the ocean. The expense of the apparatus for securing such specimens is far beyond anything but what the most favored persons can command. On this account it was thought proper to do the work as far as possible for the whole country as well as for the National Museum, and numerous objects of this kind have been obtained and are now being properly arranged and packed under competent direction for distribution. Many sets of these will be in this way scattered throughout the country, to the very great advantage of science.

One material result of the work of the past summer has been the discovery of an entirely new food-fish off the coast, both genus and species being previously unknown to science. This is the *Lopholatilus chameleonticeps*, or tile-fish. A bank where this fish is found was discovered near Noman's Land, where it can be taken in any desired quantity; some specimens obtained weighing as much as ninety pounds. As the fish has very much the same general food characteristics as the cod, there is reason to believe that in time it will become an imporant article of trade.

A great extension was also established in the distribution of the new fish discovered in June, 1877, off the coast of Gloucester, namely, the pole flounder, or *Glyptocephalus cynoglossus*. This is a species of flat-fish, the occurrence of which along our shores was entirely unknown at the time, not being taken on the trawls of the fishermen, while at the same time it is possibly the most abundant species of its family on the coast. In the smallness of its mouth, which prevents its being captured by the hook, and the lack of use of the beam-trawl as a fisherman's engine, are to be found the explanation of the ignorance of the fishermen in regard to the species.

The second division of the work of the United States Fish Commission, that of the multiplication and distribution of useful food-fishes, has also been carried on during the year on a greatly enlarged scale.

Special work was done at Avoca, in Albemarle Sound, in connection with the shad and fresh-water herring, many millions being hatched out, of which the greater part were distributed to the interior waters of North Carolina, South Carolina, Georgia, and other States. A very important extension of the work consisted in the successful experiment of the artificial propagation of the striped bass or rockfish, a species of great economical importance, but which had hitherto eluded all our search during its spawning season.

The second station for the hatching of shad was established as in previous years at a point a short distance below Havre de Grace, on the Susquehanna River, where also many millions were produced. About half of the number were planted in the Susquehanna itself, for the purpose of keeping up the supply. The remainder were distributed to. numerous States throughout the Union.

The station on the McCloud River, California, for procuring the eggs of the California salmon, was efficiently worked by Mr. Livingston Stone, the superintendent. About eight millions of eggs were obtained and distributed, for the most part, to the commissioners of the different States. One hundred thousand eggs were presented to each of the governments of France, Holland, and Germany, where the California salmon is greatly appreciated from its promise of furnishing a very important addition to the food resources of Europe.

Arrangements are now being made on the McCloud River for the hatching of the California trout, which has some peculiarities which render it desirable for introduction to the Eastern States.

Other stations were at Bucksport, Me., for the propagation of the sea-salmon, and at Grand Lake Stream for land-locked salmon, both being in charge of Mr. Charles G. Atkins, and furnishing their quota of material for the multiplication of food-fishes.

After several years of effort, the commission has been able to obtain a stock of German carp for distribution. This fish promises to be of great economical value, and the demand for it is very great, numerous applications being received every day from all parts of the country. About ten thousand have already been distributed, at the rate of about eight pairs to each applicant, meeting but a small part of the demand. The stock for the year 1880, it is hoped, will supply this in a measurable degree.

The experiments initiated at Gloucester in 1878, looking towards the artificial propagation of the cod, were carried to completion in February, 1879, about one and a half millions of fish having been hatched out and placed in Gloucester Harbor. The experiment was in every way satisfactory, and the experience gained will be of the utmost benefit in the future. The harbor of Gloucester, during the past summer, was full of young codfish hatched out in this way, presenting a palpable feature of the work, which was appreciated by all the inhabitants of that city.

For the purpose of more efficiently conducting the work of the commission in connection with the shad, herring, striped bass, codfish, and other species, an appropriation of $45,000 was made in March last by Congress for the construction of a suitable steamer, which should serve as a floating hatching establishment. This vessel is nearly completed, and will, it is hoped, be ready for the work of 1880.

Mr. Newton P. Scudder was sent, during the summer of 1879, to study the halibut fisheries on the coast of Greenland. For a number of years the Holsteinburg Banks, a short distance south of Disco, Greenland, were visited by from one to seven vessels from Gloucester, annually. These vessels remained three or four months on the fishing-ground, and salted down in their holds the halibut which they caught, and which were brought home to be prepared in the smoke-houses.

Mr. Scudder sailed from Gloucester on the schooner Bunker Hill, June 10, 1879, and on his return arrived in Gloucester September 17. He secured a fine collection of Arctic marine birds, also, an interesting series of Arctic fishes and invertebrates, and some valuable ethnological specimens.

Mr. H. L. Osborne was sent to the Grand Banks to study the methods of the deep-sea cod fishery of that region. He left Gloucester on the schooner Victor, July 10, and returned home in the latter part of October. His natural history collections were quite extensive, especially of the different species of mollusks; and he has in preparation an elaborate report upon the methods of this fishery and the characteristics of the fishermen and the results of his natural history exploration.

Mr. J. P. Gordy made a short cruise on a Gloucester mackerel schooner, and has presented a report upon the mental and moral characteristics of the fishermen and upon the methods of this fishery. He returned to Gloucester August 3, after an absence of three weeks.

CO-OPERATION OF THE UNITED STATES FISH COMMISSION AND OF THE CENSUS OF 1880.

In the previous reports of the Census Department, the almost ludicrous incompleteness of that portion relating to the fisheries has been a matter of notoriety; and it was with much pleasure that I received an invitation, as Secretary of the Smithsonian Institution and United States Fish Commissioner, from General Walker, Superintendent of the Census, to suggest a plan by which this defect might be remedied. At

General Walker's request, I undertook the work of organizing that department, and of employing all the machinery of the United States Fish Commission in its behalf.

Mr. G. Brown Goode, the curator of the National Museum, was assigned to the special work of direction, and with the assistance of the regular force of the commission and persons especially employed at the expense of the census appropriation, a systematic plan of operations was laid out and is now being carried into effect. Experienced and trained observers have been sent to different portions of the coast as canvassers and investigators, it being the intention that every fishing village on the Atlantic, Pacific, Gulf, and Great Lake coasts shall be properly canvassed. Numerous circulars have been sent out to the interior, asking for information.

For the purpose of better supervising the collation of data and the tabulation of results, accommodations have been furnished in the east wing of the Smithsonian building, where the parties have been at work, under the direction of Mr. Goode. Mr. Charles W. Smiley is in charge of the office, with a number of clerks detailed by General Walker for his assistance. The principal canvassers at work in the field are Mr. R. E. Earll, for the New England coast generally; Mr. Charles G. Atkins, having special charge of the statistics of the salmon, herring, alewife, and smelt fisheries in Maine; Mr. Silas Stearns, assisted by Mr. S. T. Walker, for the Gulf of Mexico; Col. Marshall McDonald, for the shad fisheries of Virginia and the southern coast; Mr. R. T. Edmunds, the oyster and fresh-fish trade of the Chesapeake Bay and Baltimore; Mr. B. Phillips, for the fish manufacturing industry of New York; Mr. L. Kumlien, for the fisheries of the Great Lakes; and Prof. D. S. Jordan, for the fisheries of the Pacific Coast. In addition to these, Mr. Ernest Ingersoll has general charge of the statistics of the oyster trade of the whole eastern coast. All these gentlemen have been at work for a greater or less time, some of them since July last, and have transmitted to the office in Washington an immense amount of information.

It is confidently expected that the report of General Walker on the subject of the fisheries will be not inferior in any respect to other special reports for which he has made arrangements.

In addition to the collecting of statistics, the employés of this division have been instructed to obtain illustrations of the fisheries, such as specimens or models of fishing-gear, nets, boats, traps, &c.; samples of prepared fish and the like; they are also gathering a great deal of information relating to the natural history of the marine and fresh-water animals.

A very important corollary of this work is the information it will furnish for use in any future arbitration between the United States and the British Provinces in regard to the value of its coast fisheries. It is well known that the cause of the United States, at the meeting in Halifax in 1877, went almost by default in consequence of the absence of this information. While the Canadians possessed the fullest data on the subject of the fisheries, as the result of many years inquiry, the United States had nothing whatever but what was gathered with special reference to the emergency. The results gathered in connection with the census of 1880 will, it is hoped, be tabulated and published by the time this is needed for diplomatic use, and it will be of inestimable advantage in strengthening any position that the American Government may take in reference to the nature of the American fisheries.

Respectfully submitted.

SPENCER F. BAIRD,
Secretary Smithsonian Institution.

WASHINGTON, D. C., *January*, 1880.

APPENDIX TO THE REPORT OF THE SECRETARY.

Table showing the number of entries in the record-books of the United States National Museum at the close of the years 1878 *and* 1879, *respectively.*

[These tables show only what has been recorded or entered in the detailed catalogue, constituting but a small proportion of the whole.]

Class.	1878.	1879.
Mammals	13,069	13,144
Birds	76,666	79,093
Reptiles and amphibians	10,015	10,407
Fishes	22,000	23,561
Skeletons and skulls	16,155	16,306
Eggs	17,791	18,049
Crustaceans	2,324	2,324
Annelids	100	100
Mollusks	31,268	33,169
Radiates	3,230	3,230
Invertebrate fossils	8,020	8,075
Minerals	20,135	20,450
Ethnological specimens	34,600	39,017
Total	255,373	266,925
Increase for 1879	....	11,552

Approximate table of the distribution of duplicate specimens to the end of 1879.

Class.	Total to the end of 1878.		Distribution during 1879.		Total to the end of 1879.	
	Species.	Specimens.	Species.	Specimens.	Species.	Specimens.
Skeletons and skulls	540	1,878	46	46	586	1,924
Mammals	2,167	4,822	....	....	2,167	4,822
Birds	27,717	42,014	223	304	27,940	42,318
Reptiles	2,356	3,840	210	318	2,566	4,158
Fishes	6,145	9,651	298	325	6,443	9,976
Nests and eggs of birds	7,906	19,350	328	1,161	8,234	20,511
Insects	4,308	9,741	230	350	4,538	10,091
Crustaceans	1,087	2,664	10	25	1,097	2,689
Shells	90,548	197,347	154	481	90,702	197,828
Radiates	593	793	....	....	593	793
Other marine invertebrates	1,892	5,225	15	15	1,907	5,240
Plants and packages of seeds	29,943	51,984	499	877	30,442	52,861
Fossils	4,391	10,518	....	....	4,391	10,518
Minerals and rocks	9,105	16,869	901	4,538	10,006	21,407
Ethnological specimens	3,623	5,268	226	226	3,849	5,494
Diatomaceous earths (packages)	874	1,628	300	300	1,174	1,928
Total	193,195	383,592	3,440	8,966	196,635	392,558

ADDITIONS TO THE COLLECTIONS OF THE NATIONAL MUSEUM IN 1879.

Adney, W. H. G. Specimens of shells and fossils; from Virginia.

Alaska Commercial Company, San Francisco, Cal. Two heads of sea-lion (*Rosmarus obesus*); from Nushagak, Alaska.

Alden, Capt. Oscar W., and crew of schooner Andrew Leighton. (See Washington, D. C., United States Fish Commission.)

Alderncthy, George. Samples of coal; from Washington Territory.

Allen, C. A. Two specimens *Anser rossii* (purchased); from California.

Allen, George K. (See Washington, D. C., United States Fish Commission.)

Anderson, Capt. Charles, and crew of schooner Alice G. Wonson, Gloucester, Mass. (See Washington, D. C., United States Fish Commission.)

Anderson, John. Insect; from Texas.

Anderson, W. W. Small collection of stone implements; from Sumter County, South Carolina.

Andrews, Miss Fannie. Box of stone implements and minerals; from Georgia.

Ardendall, Edward, schooner Sea Foam. (See Washington, D. C., United States Fish Commission.)

Aspinwall, Dr. F. E. Specimens of arrow-heads; from New York and Ohio.

Atkins, Charles G. Specimen of togue (*Cristivomer namaycush*); from Grand Lake Stream, Maine.

Augir, Viola. Two mounted specimens of birds; from Illinois.

Baird, G. W., P. A. Engineer, U. S. N. Specimens of *Medusæ;* taken at Ville Franche, France.

Baird, Prof. S. F. (See Washington, D. C., United States Fish Commission.)

Babcock, A. L. Specimens of birds (*Cyanura cristata* and *Sialia sialis*), and red squirrel (*Sciurus hudsonius*); from Massachusetts.

Baden, George P. Living milk-snake (*Ophibolus doliatus*); from Washington, D. C.

Baker, J. D. Specimen of insect; from Perry County, Pennsylvania.

Barker, H. L. Living specimens of glass-snake (*Opheosaurus ventralis*), turtles (*Pseudemys scabra*), and amphiumas (*Amphiuma means*); from South Carolina.

Barringer, A. L. Living snakes (*Bascanion constrictor*, *Ophibolus rhombomaculatus* and *Storeria dekayi*) and terrapins (*Cistudo clausa*); from North Carolina.

Bates, W. H. H. Specimens of minerals; from Maine.

Bauermeister, Rev. William. Box of minerals; from Indiana.

Beach, H. Box of stone implements, pottery, &c., from Illinois and Wisconsin.

Beal, William. Two living bull-snakes (*Pityophis melanoleucus*); from Tennessee.

Bean, Barton A. Unfinished dulled stone implements; from Pennsylvania.

Bean, Dr. T. H. Box of Indian implements and terrapin (*Cistudo clausa*); from Pennsylvania.

Beauchamp, Rev. William M. A collection of shells; from Western New York.

Belding, L. Five boxes of birds-skins, eggs, and dried plants; from California.

Belknap, Lieut. C., U. S. N. Samples of the woods of Japan and the Philippine Islands.

Bell, Charles W. Specimen of iron-pyrites; from Texas.

Benner, F. M. Box of stone relics; from Ohio.

Bennett, Henry R. Fragments of pottery; from near Cape Henlopen, Delaware.

Bennett, J. C. Specimens of Indian stone implements; from Ohio.

Benton, John H. A living alligator (*Alligator mississippiensis*; from Florida.

Bessels, Dr. Emil. Alcoholic specimens of *Amphioxus*; from the Eastern shore of Maryland.

Bigelow, Otis M. Cast of Indian bird-shaped pipe; from New York.

Bissel, E. H. Specimens of insects; from North Carolina.

Blackford, E. G., Fulton Fish Market, New York. A large and varied collection of fishes, brought into the New York fish-market, among which are *Cryptacanthodes*, *Centropomus*, *Sargus Holbrookii*, *Pagrus vulgaris*, *Salmo solar*, *Onchorhynchus quinnat*, *Coregonus* sp., *Pomatomus saltatrix*, *Scomber scombrus*, &c.

Bland, Thomas. Specimen of abnormal egg of chicken; from Jamaica, L. I.

Bloomfield, James C. Pharyngeal teeth of *Haploidonotus grunniens*.

Boardman, George A. Two birds-skins, nests, and eggs; from Maine.

Bomar, Thomas H. Specimen of calcite; from South Carolina.

Boars, H. Case fishery apparatus; from Norway.

Bonbright, Stephen L. Three skins of birds; from Iowa.

Booth, A. Specimens of California salmon (*O. Quinnat*).

Booth, M. A. Small package of recent diatoms; from Massachusetts.

Booth, Lieut. S. M., U. S. N. Suit of armor worn by the natives of the Kingsmill group of Pacific Islands.

Bowers, W. W. Sample of meat prepared by the Chinese from the abalone (*Haliotis*).

Boyd, Miss E. S. Human cranium; from the Hawaiian Islands.

Boyd, Dr. S. B. Double-headed snake; from Tennessee.

Boyle, Dr. David, Elora Museum, Ontario. Beads found in cavern on Grand River, Ontario; and slate tablet (lent).

Brace, Lewis J. K. A box of general natural history collections; from Nassau, New Providence.

Brackett, Col. A. G., U. S. A. A specimen of the black-footed ferret (*Putorius nigripes*); from Montana.

Bracking, Alfred. Specimen of mineral; from North Carolina.

Brady, Henry B. Microscopic mountings of Carboniferous foraminifera; from Newcastle-on-Tyne, England.

Brantley, W. S. Living specimen of ground rattle (*Caudisona miliaris*); from Georgia.

Bregazzi, Miss Marie. Living bat (*Scotophilus fuscus*); from Washington, D. C.

Brewer, Dr. T. M. Box of birds' skins.

Brewster, William. Nest and four eggs of brown creeper; from Massachusetts.

Brown, James, Schooner David A. Osier. (See Washington, D. C., United States Fish Commission.)

Brown, Dr. J. J. Jar of alcoholic reptiles; from the West Indies.

Brown, Seavy & Co, Boston, Mass. Specimens of mackerel (*Scomber scombrus*) and viscera of same.

Brownell, W. A. A collection of minerals.

Bruner, J. Human mummy, encased; from Cuzco, Peru.

Budd, James. Specimen of moth (*Enyo lugubris*); from North Carolina.

Bunnell, P. D. Specimen of mineral; from Washington Territory.

Burbage, John. Skin of weasel (*Putorius erminea*), pupa-state of tobacco-worm, living snakes (*Heterodon platyrhinus* and *Eutænia sirtalis*), and mineral concretion; from Missouri.

Burford, H. Specimen of tarantula; from Georgia.

Burnham, E. K. (See Washington, D. C., United States Fish Commission.)

Burr, R. T., A. A. Surgeon, U. S. A. Small box of pottery, and alcoholic specimens of fishes, reptiles, &c.; from Arizona.

Cairns, William. Stone-gouge; from Westchester County, New York.

Cambridge, Mass., Harvard Botanical Gardens, Prof. C. S. Sargent, in charge. Eight species of living water-plants.

Campbell, Capt. David, and crew of schooner Admiral. (See Washington, D. C., United States Fish Commission.)

Campbell, D. H. Specimen of insect; from Illinois.

Campbell, Kent. Cocoons of insects; from Ohio.

Capehart, Dr. W. R. Specimens of rock-fish, shad, alewives, and a jar of herring-roe; from Albemarle Sound.

Capps, C. Henry. Specimens of minerals; from Calvert County, Alabama.

Carlin, W. M. A collection of fishes; from Wyoming.

Carr, J. C. Fragments of fossils; from Tennessee.

Carr, H. H. Specimens of shed skin of snake and rattle of rattlesnake; from Texas and Wyoming.

Carter, C. Shirley. Two specimens in alcohol of *Ancistrodon contortrix;* from Virginia.

Castleman, D. J. Specimen of insect; from Alabama.

Cavanaugh, Capt. John, and crew of schooner Alfred Walen. (See Washington, D. C., United States Fish Commission.)

Chapin, Dr. E. M. Small box of fragmentary mound-pottery; from Scott County, Georgia.

Chesley, Edward. Wooden model of the shad.

Chester, Capt. H. C. Specimen of flying-fish (*Dactylopterus volitans*); from Noank, Conn.

Choate, Warren. Specimen of ore; from Leadville, Colo.

Christiania, Norway, Museum of, through Professors Collett and Esmark. Seventy-one species of Norwegian fishes.

Church, D. F. Specimens of menhaden and menhaden-spawn; from Narragansett Bay.

Clark, E. T. Specimens of fishes and worms; from Gloucester, Mass., Harbor.

Cleneay, Thomas. Collection of Indian stone axes, pestles, hammers, scrapers, &c.; from Ohio.

Collins, Capt. David E., and crew of schooner Gussie Blairsdell. (See Washington, D. C., United States Fish Commission.)

Collins, Capt. John, and crew of schooner Albert H. Harding. (See Washington, D. C., United States Fish Commission.)

Collins, Capt. J. W., schooner Marion. (See Washington, D. C., United States Fish Commission.)

Copley, C. J., Stapleton, S. I., L. I. Specimens of fishes, *Notemigonus chrysoleucus, Argyreiosus capellaris, Catostomus commersonii.*

Cook, Richard E. Specimens of mineral; from Clay County, Alabama.

Cooper, W. A. Box of birds, nests, and eggs, and a few shells; from California.

Cornwall, A. B. Bear's tooth.

Corey, Warren H. Specimens of two water-beetles from Minnesota.

Corson, Joseph K., A. A. Surgeon, U. S. A. Two living turtles; from California.

Coues, Dr. Elliott. Type specimens of *Dendroica kirtlandi;* and two specimens of *Budytes taivanus*, from Formosa; eggs of *Perisoreus canadensis*, from Vermont.

Covert, A. B. Specimens of albino mouse, *Hesperomys leucopus*, from Michigan.

Crane, H. L. Specimens of stone relics; from Florida.

Crawford, S. W. Box of bird-skins from Iceland.

Critchett, Capt. John F., and crew of schooner Commonwealth. (See Washington, D. C., United States Fish Commission.)

Crooks, Nathaniel, schooner Helen M. Dennis. (See Washington, D. C., United States Fish Commission.)

Cunningham, Capt. Augustus, schooner Geo. A. Upton. (See Washington, D. C., United States Fish Commission.)

Curzon, Capt., schooner Mist. (See Washington, D. C., United States Fish Commission.)

Curtis, Capt. George H., and crew of schooner Conductor. (See Washington, D. C., United States Fish Commission.)

Cushing, F. H. Medicine war-dress of "Moon Plume," a Cheyenne chief (purchased), and box of Indian relics; from mound near Saint Louis, Mo.

Dall, W. H. Skull and horns of deer (*Cervus aristotelis*); from the highlands of India.

Davis, A. J., through Thomas Donaldson. Specimens of silver and gold bullion from the Lexington Mine Butte, Montana.

Davis, Henry. Specimens of birds' nests, and eggs, fossils, minerals, and Indian relics; from Iowa.

Davis, Hon. Horace. Pair of Chinese shoes; from California.

Davis, W. E. Fourteen living turtles (*Pseudemys scabra*); from North Carolina.

Dawson, Prof. J. W., Montreal, Canada. Specimen of *Eozoon canadense.*

Dempsey, Capt. William. (See Washington, D. C., United States Fish Commission.)

Derry, C. W. Specimens of silver ore; from Leadville, Colo.

De Tarr, D. N. Skin of neck and heads of double-headed calf.

Dickinson, E. Box of birds' nests from Massachusetts.

Diggs, Meredith, Washington, D. C. Prepared skeleton of fish, *Lutjanus blackfordii.*

Dodd, Andrew W. (See Washington, D. C., United States Fish Commission.)

Dolliver, Capt. Peter, and crew, of schooner Grace L. Fears. (See Washton, D. C., United States Fish Commission.)

Dolph, John M. Specimens of fish parasites.

Dosch, Samuel E. Specimens of minerals; from District of Columbia.

Douglass, Albert. (See Washington, D. C., United States Fish Commission.)

Douglass, W. Grooved stone axe; from Fauquier County, Virginia.

Dowell, John. Specimen of shad (*Alosa sapidissima*); from the Potomac River.

Downman, R. H. A fresh specimen of blue-fish (*Pomatomus saltatrix*) and living snakes (*Ophibolus getulus, Spiloties erebennus*) and turtles (*Chelydra serpentina*); from Virginia.

Driggs, J. W. Collection of birds' skins (purchased) and skeleton of *Tantalus loculatos;* from Florida.

Dybovoski, W., Russia. Box of shells (purchased); Baikal Sea.

Dufer, B. W. Insect from Arkansas.

Dunny, Lathrop, through Thomas Donaldson. Specimens of silver ore; from the Alice Mine, Butte, Montana.

Dugès, Prof. Alfredo. Box of birds, insects, antiquities, shells, &c.; from Mexico.

Dunham, James C. Skins of dog-fish; from Provincetown, Mass.

Dupré, D. A. Specimens of minerals; from Virginia.

Dyer, Captain. (See Washington, D. C., United States Fish Commission.)

Earle, J. W. Box of Indian stone relics, pottery, &c.; from South Carolina.

Earll, R. E. Photographs of pogie steamers and living specimen of *Amblystoma punctatum;* from Maine.

Edwards, Vinal N. Eighteen boxes of general marine collections; from Wood's Holl, Mass.

Edmunds, Hon. J. E., Washington, D. C. Three birds, two linnets, one woodpecker.

Edmunds, Hon. J. M., city postmaster, Washington, D. C. Wings of mallard duck.

Egan, W. C. Box invertebrate fossils; from Niagara Group, Illinois.

Eldridge, Woodbury, through W. Oakes. Vertebra of whale; from Ipswich Bay.

Emanuel, J. M., P. A. Engineer, U. S. N. Specimen of insect; from James River, Virginia.

Ernst, A. Dr. Box of pottery and stone implements; from Venezuela.

Evans, S. B. Three fossils; from Iowa.

Feuardent, Gaston L. A collection of pottery and implements of the Archæolithic, Neolithic, Lacustrine, and Bronze ages.

Ferguson, T. B. Specimens of fish (*Prionotus*, *Tetrodon*, *Achirus*, &c.), from the Rappahannock River; box of fishes, from Crisfield, Md.

Ferguson, S. Specimen of *Diemictylus miniatus*.

Ferguson, S. W. Living snapping-turtle (*Chelonura temminckii*); from the Mississippi River.

Fickel, Isaac H. Arrow-head chip.

Finsch, Dr. Otto. Three human skulls, and tooth of *Rhinoceros tichorhinus;* from Western Siberia.

Flaherty, Michael. (See Washington, D. C., United States Fish Commission.)

Forbes, Capt. Maurice, schooner Eastern Light. (See Washington, D. C., United States Fish Commission.)

Fowles, Frank, schooner Young Sultan, of Wiscasset. (See Washington, D. C., United States Fish Commission.)

Fowles, Capt. M. V., and crew of schooner Young Sultan. (See Washington, D. C., United States Fish Commission.)

French, John H., McMinnville, Tenn. Specimen carved stone tube.

Friele, Prof. H. Small collection of shells collected by the Norwegian Deep-Sea Expedition, in the North Atlantic Ocean.

Friel, Joseph. Box of Indian relics from Kentucky.

Friend, George. (See Washington, D. C., United States Fish Commission.)

Friend, Lemuel, through Capt. J. W. Collins. (See Washington, D. C., United States Fish Commission.)

Galbraith, Frank G. Two boxes of Indian implements and water-worn pebble, from Eastern Pennsylvania; sculptured rock, from the Susquehanna River.

Garman, S. W., from Prof. A. Agassiz. Living turtle (*Testudo tabulata*); from Trinidad.

Gartley, A. M. Specimens of minerals; from Pennsylvania.

Gatke, H. Collection of birds' skins; from Heligoland, Germany.

Gatschet, Prof. Albert S. Seven arrow-heads from Rhode Island.

Gecks, A., Hospital Steward, U. S. A. Specimens of fragmentary pottery, and copper disk found in skull taken from mound near Fort Sisseton, Dak.

Gere, J. E. Specimens of copper and stone implements, minerals, hornet's nest, &c.; from Wisconsin.

Gerend, John. Insect; from Wisconsin.

Getschell, Capt. John, Q., schooner Otis P. Lord. (See Washington, D. C., United States Fish Commission.)

Gibbs, George J. A collection of birds' eggs, and seeds of *Corda irex*, sponge, and specimen of gypsum; from Turk's Island, West Indies.

Gill, Capt. Russell G., schooner Maud Gertrude. (See Washington, D. C., United States Fish Commission.)

Gilpatrick, Capt. Briggs, and crew of schooner Herbert M. Rogers. (See Washington, D. C., United States Fish Commission.)

Gilpatrick, Capt. Gilman, schooner Seth Stockbridge. (See Washington, D. C., United States Fish Commission.)

Gilpin, Dr. Bernard. Jar of alcoholic specimens of *Insectivora;* from Nova Scotia.

Glidden, Albert. Hornet's nest; from Damariscotta.

Goldsmith, J. B. (See Washington, D. C., United States Fish Commission.)

Goldsmith, S. Living specimens of garter-snake (*Eutænia sirtalis*); from Maryland.

Goode, Prof. G. Brown. Specimens of fish (*Cynoscion, Lagodon rhomboides, Orthopristis fulvomaculatus*), from Norfolk, Va.; and spinning wheel and appurtenance of the eighteenth century.

Goode, F. C. Can of alcoholic specimens of fishes, reptiles, &c.; from Florida.

Goodwin, Capt. Thomas, and crew of schooner Howard. (See Washington, D. C., United States Fish Commission.

Goodwyn, T. Gray. Eggs of the thrush, blue-bird, and swallow; from West Virginia.

Gore, J. H. Skull of rabbit with prolongated teeth.

Gorham, R. P. Pharyngeal bone of drum-fish.

Gorman, Capt. John, and crew, of schooner Geo. S. Boutwell. (See Washington, D. C., United States Fish Commission.)

Gorringe, Lieutenant Commander, U. S. N. Piece of water-pipe and slab; from the ruins of ancient Troy.

Gorton, C. Specimens of soapstone mask and box of Indian relics (lent).

Goti, Addison. (See Washington, D. C., United States Fish Commission.)

Gourville, Capt. John, and crew of schooner Rebecca Bartlett. (See Washington, D. C., United States Fish Commission.)

Goward, G. An article of apparel, lava-lava, worn by the natives of the Samoan Islands.

Graham, Dr. A. H. A Spanish spear and living specimens of scorpion and centipede; from Bagdad, Tex.

Graves, A. Three jars of fishes, some new to science; from Georgia.

Green, Fred. C. Specimens of chain and honey-comb coral; from the Mississippi River.

Green, Dr. J. B. Living specimen of garter-snake (*Eutœnia sirtalis*); from Fairfax County, Virginia.

Green, W. N. Box of minerals from Virginia.

Greenleaf, Capt. Nathaniel, and crew of schooner Grace L. Fears. (See Washington, D. C., United States Fish Commission.)

Greenleaf, Capt. Thomas F., and crew of schooner Chester R. Lawrence. (See Washington, D. C., United States Fish Commission.)

Greenwood, Captain, and crew of schooner Sultana. (See Washington, D. C., United States Fish Commission.)

Gretan, Capt. John. Very large specimen of lump-fish (*Cyclopterus lumpus*); from Kettle Island, Massachusetts.

Gunter, Hon. T. M. Specimen of ore.

Habirsham, F. Microscopic slides of diatoms put up by Prof. P. T. Cleve and J. D. Muller, of Upsala, Sweden.

Habersham, Wm. Neyle. Photograph of a *Histiophorus gladius;* taken off Florida.

Hamilton, A. M. Specimens of minerals; from Virginia.

Hamilton, Hugh. Water beetle; from Pennsylvania.

Hamlin, F. M. Three boxes of general natural history collections; from Bermuda.

Hamlin, Capt. Peter, and crew of schooner Andrew Leighton. (See Washington, D. C., United States Fish Commission.)

Hanna, G. B., through Mrs. N. S. Lincoln. Specimen of mounted owl; from North Carolina.

Hanson, James, schooner Sarah P. Ayer. Specimens of tree-coral, *Paragorgia*, with barnacles attached.

Harrell, Alexander, through Hon. R. W. Townshend. Box of minerals and a stone ax; from Clay County, Illinois.

Harrison, Joseph, estate of. A large collection of paintings, by Catlin, of North American Indians.

Harrison, M. E. Box of Indian stone implements, fossils, &c.; from Missouri.

Harsha, W. W. Specimens of slag; from Illinois.

Hartfield, John M. A living turtle; from North Carolina.

Hartman, Dr. W. D. A collection of shells (*Partulas*).

Hayden, Dr. F. V. A collection of plants of the Yellowstone region.

Hayes, Dr. W. W. A specimen of *Dendrocygna fulva*; from California.

Hayward, F. W. A jar of alcoholic specimens of sirens, frogs, and toads; from South Carolina.

Heffleman, Dorr. Specimen of ore; from Dakota.

Hemphill, Henry. Twenty-two species and varieties of shells; from California.

Hereford, Hon. Frank. Specimens of coal; from Monroe County, West Virginia.

Hering, Dr. C. J. A large collection of plants and alcoholic specimens of reptiles, mammals, &c.; from Surinam, Dutch Guiana.

Herran, Thomas. A box of Indian pottery and specimens of locusts; from Antioquia, United States of Colombia.

Herrick, Capt. William, schooner Augusta Herrick. (See Washington, D. C., United States Fish Commission.)

Hessel, Dr. Rudolph. Living snake (*Tropidonotus sipedon*); from Washington, D. C.

Hess, G. E. Indian arrow-head; from Mississippi.

High, Augustus. Specimen of silver ore.

Hill, H. H. Five casts of Indian relics.

Hitchcock, George N. Head, shell, and claws of turtle (*Chelopus marmoratus*); from California.

Hobbs, George S. Living turtle and snake and bull-minnow; from Washington, D. C.

Hodgdon, Capt. Thomas, and crew of schooner Bessie W. Somes. (See Washington, D. C., United States Fish Commission.)

Hodgdon, Capt. W. F., and crew of schooner Proctor Brothers. (See Washington, D. C., United States Fish Commission.)

Hodgkins, Joshua. Living snake (*Ophibolus doliatus*); from Georgetown, D. C.

Hoffman, Dr. W. J. Bone fish-hook; used by the Indians of Grand River, Dakota.

Holbrook, A. F. Large specimen of sea-cucumber (*Pentacta frondosa*); from off Cape Cod.

Holbrook, Joseph E., schooner Jennie T. Phillips, of Swampscott. (See Washington, D. C., United States Fish Commission.)

Holloman, W. H. Samples of quartz; from Lousiana.

Hoover, Edward. Skins of short-eared owl and albino red-wing blackbird (*Agelæus phœniceus*); from Washington, D. C.

Horan, Henry. Living snakes (*Bascanion constrictor*, *Heterodon platyrhinus*, *Tropidonotus sipedon*, *Eutænia sirtalis*) and stink-pot turtle (*Aromochelys odoratus*); from Virginia. Also specimen of American sole (*Achirus lineatus*).

Horn, Dr. George H. Fragments of fossils (*Orthoceras* and *Favosites*); from the Indian Territory.

House, J. C. and O. A. McClain. Model of fish-hatching box.

Houston, Senator George S. Specimen of mineral; from Alabama.

Howard, E. B. Specimens of ore; from Arkansas.

Hoy, George W., schooner Mary F. Chisholm. (See Washington, D. C., United States Fish Commission.)

Hoyt, Edward F. (See Washington, D. C., United States Fish Commission.)

Hoyt, W. E. (See Washington, D. C., United States Fish Commission.)

Humphreys, Prof. John T. Three boxes of minerals and Indian relics; from North Carolina.

Hurlbert Capt. R. H., schooner Sultana. (See Washington, D. C., United States Fish Commission.)

Hurlbert, Capt. William, schooner Franklin S. Schenck. (See Washington, D. C., United States Fish Commission.)

Huston, S. Box of stone implements; from Ohio.

Ingersoll, Ernest. Four boxes of oyster shells; from New Brunswick and from various places along the New England coast.

Isaac, J. C. Specimen of tufa; from Hot Springs, Arkansas.

Irwin, Dr. B. J. D., U. S. A. Spy-glass case covered with skin of Gila monster (*Heloderma suspectum*).

Jack, J. Allen. Loan of the St. George Stone from New Brunswick.

James, Dr. Frank L. Four boxes of Indian stone implements, pottery, and images; from Arkansas and Mississippi.

Jefferson, Lieut. J. P. A bottle of sea-water; from the Dry Tortugas, Florida.

Jenison, O. A. Box of stone implements; from Michigan. Lent for the purpose of making casts.

Johnson, Captain. Occipital portion of the skull of a whale taken on the Southern coast.

Johnson, Capt. Benjamin, schooner Alaska. (See Washington, D. C., United States Fish Commission.)

Johnson, Capt. Charles, schooner Lucille Curtis. (See Washington, D. C., United States Fish Commission.)

Johnson, Christian, schooner Wm. Thompson. (See Washington, D. C., United States Fish Commission.)

Johnson, Capt. George A., and crew of schooner Augusta Johnson. (See Washington, D. C., United States Fish Commission.)

Johnson, G. W. Five birds' skins (*Vireo pusillus, Melospiza Heermanni,* &c.); from California.

Johnson, Capt. Otis, schooner Helen M. Dennis. (See Washington, D. C., United States Fish Commission.)

Johnson, Capt. P., schooner John Smith. (See Washington, D. C., United States Fish Commission.)

Jones, Mrs. Ellen. Samples of soil from Frederick, Md.

Jones, Samuel H. A specimen of the rare field-mouse (*Hesperomys aureolus*); from Florida.

Jordan, Prof. D. S. A collection of Venetian fishes; also, a collection of fishes and reptiles from Indiana.

Jouy, P. L. A specimen of lizard (*Desmognathus fusca*) and turtle (*Cistudo clausa*).

Joyce, Captain. Specimens of mackerel spawn; from Swan's Island, Castine, Me.

Joyce, John A. Specimen of magnetite; from Montana.

Kaufman, J. Specimen of mineral; from Texas.

Keller, F. K. Duck, hybrid between mallard and pintail.

Kelly, Alfred W. P. Photographs of New Zealand and Australian aborigines.

Kerr, Prof. W. C. Indian stone spade; from North Carolina.

Kilbourne, S. R. Specimens of fishes (*Salmo* and *Cottus*); from Long Lake, New York.

King, T. W. Specimen of mineral; from Texas.

Kingsbury, W. W. Specimens of clay; from Pennsylvania.

Kirby, Capt. W. H., and crew of schooner Wm. V. Hutchings. (See Washington, D. C., United States Fish Commission.)

Kirk, Isaac S. Specimens of stone implements and minerals; from Chester County, Pennsylvania.

Knight, La F. Human bones; from Indian grave.

Koch, L. L. Box of *Unionidæ;* from Illinois.

Kock, August. Parent and nest and eggs of the rough-winged swallow.

Kumlien, L. Specimens of birds, reptiles, and fishes; from Wisconsin and Michigan.

L'Acee. Specimen of mineral; from Florida.

La Barre, Miss Mollie. Living owl (*Bubo virginianus*); from Washington, D. C.

Lamasure, Edwin. Living turtle (*Cistudo clausa*).

Lane, H. B. Specimen of bug; from Virginia.

Langdon, F. W. Two specimens of crania; from Ohio.

Layard, E. L. British consulate of Noumea. Small collection of New Caledonian birds.

Larkin, Dr. Frederick. Flint arrow-heads from New York.

Lawrence, Geo. N. Mounted specimen of Labrador duck (purchased).

Lea, Dr. Isaac. Specimens of fossil (*Goniobasis Lawrencii*); from Arkansas; and minerals from Pennsylvania.

Lee, Thomas, schooner Wm. H. Oakes. (See Washington, D. C., United States Fish Commission.)

Leonard, Albert. Mineral; from Pennsylvania.

Leppelman, Louis (*through Mr. Webb Hayes*). Loan of a collection of stone implements from Ohio for casting.

Lewis, C. A. Specimen of pompano (*Trachynotus carolinensis*).

Lewis, Dr. James. Box of living shells (*Viviparus*); from New York.

Lewis, L. L. Four eggs.

Ligsworth, Capt. John E., and crew of schooner Mary Story. (See Washington, D. C., United States Fish Commission.)

Lightburne, Dr. R. E., U. S. A. Box of living snakes, horn-toads, and lizards; from Arizona.

Lindahl, Prof. Joshua, and Prof. A. Nordenskjold. Meteorite; from Ovifac, Greenland. (Deposited.)

Lineback, E. W. Water-worn pebble.

Locke, J. H. Specimen of mineral; from New Hampshire.

Locke, Kate H. Specimens of rocks; from New Hampshire.

Locke, W. M. Portion of jaw of *Sciænoid* fish.

Long, D. B. Specimen of fish (*Etheostoma caprodes*); from Rock Creek, Kansas.

Lord, W. Blaine. Salmon (*Salmo salar*); from Matapediac, Canada.

Loud, P. H. Specimen of salamander (*Amblystoma punctatum*); from Edgefield County, South Carolina.

Love, J. G. Two shells; from Illinois.

Low, Charles F. Box of fragments of pottery; from Ohio.

Low, John. (See Washington, D. C., United States Fish Commission.

Lowe, F. A. Specimens of *Huntite* and *Animitite;* from Silver Islet, Ontario.

Lurvey, William. (See Washington, D. C., United States Fish Commission.)

Lyon, V. W. Fossil (*Calceola*); from Kentucky.

McCaleb, Vinal. (See Washington, D. C., United States Fish Commission.)

McCauley, Mr., schooner Wachusett. (See Washington, D. C., United States Fish Commission.)

McClenahan, R. E. Fresh specimen of pike-perch; from the Susquehanna River.

McCormack, Capt. John A., and crew of schooner Wachusett. (See Washington, D. C., United States Fish Commission.)

McCormick & Connable. Specimens of trout and white-fish.

McCormick, Lewis. Living snake (*Heterodon*), from Virginia; skink (*Eumeces fasciatus*) and newt; from Virginia.

McDonald, Capt. James, and crew of schooner Magic. (See Washington, D. C., United States Fish Commission.)

McDonald, Capt. James, and crew of schooner Willie M. Stevens. (See Washington, D. C., United States Fish Commission.)

McDonald, Lewis (through Boston Fish Bureau). (See Washington, D. C., United States Fish Commission.)

McDonald, Prof. Marshall. Specimens of menhaden (*Brevoortia tyrannus*) with parasites and a model of McDonald's fishway; also specimens of fish and Indian stone implements; from Virginia.

McDonald, Capt. William, and crew of schooner N. H. Phillips. (See Washington, D. C., United States Fish Commission.)

McDowell, W. W. Specimen of pike-perch (*Lucioperca*); from Tennessee.

McEachern Daniel, schooner Guy Cunningham. (See Washington, D. C., United States Fish Commission.)

McEachern, Daniel, schooner Rutherford B. Hayes. (See Washington, D. C., United States Fish Commission.)

McElwain, Robert. Fragments of bone; from Indian mound near Harrisville, Penn.

McGalliard, W. M. Insect.

McGraw, Phillip. (See Washington, D. C., United States Fish Commission.)

McGuire, F. B. Collection of fishes; from Teneriffe.

McGuire, J. D. Skin of bird; from Maryland.

McInnis, Capt. John, and crew of schooner M. H. Perkins. (See Washington, D. C., United States Fish Commission.)

McIntosh, Capt. Colin, and crew of schooner Nathaniel Webster. (See Washington, D. C., United States Fish Commission.)

McKinnon, Capt. Daniel, and crew of schooner Mary F. Chisholm. (See Washington, D. C., United States Fish Commission.)

McKinnon, Capt. John, and crew of schooner Ivanhoe. (See Washington, D. C., United States Fish Commission)

McKinnon, Capt. John, and crew schooner Rutherford B. Hayes. (See Washington, D. C., United States Fish Commission.)

McKinnon, Thomas. (See Washington, D. C., United States Fish Commission.)

McLean, T. P. Living snake (*Coluber obsoletus obsoletus*); from Cheat River, Maryland.

McPhee, Capt. Neil, and crew of schooner Carl Schurz. (See Washington, D. C., United States Fish Commission.)

MacKitchie, Lieutenant, U. S. N. A brick from the house General Washington was born in.

Maddox, W. M. A large hornet nest; from Anacostia, Md.

Main, Mrs. Mary E. Box of fragmentary Indian pottery; from New York.

Mandeville, Walter. Box of stone arrow-heads and minerals; from Pennsylvania.

Mansfield, James, and Sons. (See Washington, D. C., United States Fish Commission.)

Marchant, Capt. Jabez. (See Washington, D. C., United States Fish Commission.)

Markuson, Capt. C. K., and crew of schooner Notice. (See Washington, D. C., United States Fish Commission.)

Marnock, G. W. Specimens of *Lithodytes latrans*, *Eumeces semilineatus*, *Holbrookia lacerta*, and *Synophus marnockii;* from Texas.

Marsh, Prof. O. C. Cast of femur of *Atlantosaurus immanis.*

Marshall, George. Living snake (*Heterodon platyrhinus* and *Tropidonotus sipedon*); from Maryland.

Marshall, Henry. Specimens of living snakes (*Eutænia sirtalis*, *Bascanion constrictor*, *Heterodon platyrhinus*), skink (*Eumeces fasciatus*), and lizards (*Amblystoma opacum* and *Sceleporus undulatus*); from Maryland.

Martin, Capt. Charles, and crew of schooner Martha C. (See Washington, D. C., United States Fish Commission.)

Martin, Capt. George H., and crew of schooner Northern Eagle. (See Washington, D. C., United States Fish Commission.)

Martin, Capt. S. J. Young catfish (*Anarrhichas*); from Ipswich Bay.

Mason, George E. Nests of humming-bird and swallow.

Massey, Mr., through William Palmer. Living copperhead snake (*Ancistrodon contorrix*); from Virginia.

Mathews, J. H. Small reptile, picked up after rainstorm in Kansas.

Mather, Fred. Model of Mather's box for transporting salmon-eggs.

Mauler, Prof. Eugene. Samples of diatomaceous earths; from Central Europe.

Maw, George. Specimens of North African, Levantine, and Spanish pottery.

Meigs, General M. C., U. S. A. Owl (*Buteo pennsylvanicus*); from Washington, D. C., and saddle used by the Northern Cheyenne Indians.

Mendoza, Prof. G., director Museo Nacional, Mexico. Cast of obsidian vessel and specimens of axolotls (*Amblystoma Mavortium*) and cast of Mexican calendar-stone, and box of dried plants.

Merchant, George, through Procter Brothers. (See Washington, D. C., United States Fish Commission.)

Merchant, Orlando. (See Washington, D. C., United States Fish Commission.)

Merchant, Capt. Phillip, and crew, of schooner Marion. (See Washington, D. C., United States Fish Commission.)

Merrill, Mrs. C. E. Stone and copper relics and concretions; from Mississippi.

Metcalfe, Lieut. H., U. S. A. Drawings of relics found in cave at Silver City, New Mexico.

Metz, Dr. C. L. Collection of crania, pottery, bone tools, and carbonized corn; from Ohio.

Meyer, Julius. Photographs of Indians.

Meyer, Dr. J. S. Sample of composition metal.

Mexico, Museo Nacional. (See Mendoza, Prof. G.)

Mickleborough, Prof. John. Specimens of fossils; from Ohio.

Middletown, Conn., Wesleyan University. Four specimens of Ecuador-birds.

Miller, Mrs. Lois. Specimen of mineral.

Miller, S. B. Two arrow-heads; from Mississippi.

Miller, T. J. Specimen of stone implement from Wisconsin.

Mills, Clark. A collection of casts of the heads of the Indians at Hampton, Va.

Mills, S. V. Spear-head; from Pennsylvania.

Milner, James, W. A large collection of plants, fishes, reptiles, and birds; from Florida.

Moore, N. B. Small viviparous fish (Cyprinodont); from Florida.

Moose, G. W. Specimens of rocks; from South Carolina.

Morey, M. A. A collection of minerals; from Minnesota.

Morrison, Capt. R. L., and crew of schooner Laura Nelson. (See Washington, D. C., United States Fish Commission.)

Morrison, J. M. Decorated buckskin used by the Wichita Indians for shield cover.

Morrissey, Capt. James D., and crew of schooner Alice M. Williams. (See Washington, D. C., United States Fish Commission.)

Morrissey, Capt. James D., and crew of schooner Plymouth Rock. (See Washington, D. C., United States Fish Commission.)

Moulton, Capt. Charles V., and crew of schooner Peter D. Smith. (See Washington, D. C., United States Fish Commission.)

Mueller, Dr. R. Three Indian spear-heads; from Indiana.

Murphy, Capt. C. D., and crew of schooner Alice M. Williams. (See Washington, D. C., United States Fish Commission.)

Murphy, Capt. Thomas, and crew of schooner Wm. H. Oakes. (See Washington, D. C., United States Fish Commission.)

Murphy, James H. Living snake (*Heterodon platyrhinus*); from Washington, D. C.

Mynster, William A. Specimens of quinnat salmon; from Iowa.

Neihardt, M. N. Specimen of quartz from Missouri.

Nelson, Judge. Specimen of *trilobite.*

Nelson, Capt. Andrew, schooner Carleton. (See Washington, D. C., United States Fish Commission.

Nelson, E. W. Twenty-four packages of general natural-history collections; from Saint Michael's, Alaska.

Newcomb, R. L. Feathers from tail of fan-tailed pigeon.

Newlon, Dr. W. S. Specimens of fossils (*Pinna peracuta* and *Terebratula hastata*); from Kansas.

Newman, W. P. Specimen of mineral; from Missouri.

Newton, Edward. A living yellow-bellied boa (*Chilobothrus inornatus*), three living turtles, and a collection of bird skins; from Jamaica, West Indies.

New York, N. Y. Museum of Natural History, Prof. A. S. Bickmore, curator. Two hundred and ninety-five species, three hundred and eighteen specimens of birds.

Nichols, Dr. H. A. A. Specimen of gannet (*Sula piscator*); from Dominica, West Indies.

Nickerson, Capt. James, and crew of schooner Bellerophon. (See Washington, D. C., United States Fish Commission.)

Nickerson, Capt. James, and crew of schooner Commonwealth. (See Washington, D. C., United States Fish Commission.)

Norris, P. W. Specimen of silicified wood; from Yellowstone National Park.

Norwood, Ferdinand. (See Washington, D. C., United States Fish Commission.)

Olmstead, Anthony J. Five arrow-heads and chips of jasper; from Pike County, Pennsylvania.

Olmsted, E. B. Box of Indian relics; from Illinois.

Olsen, Capt. Chris., and crew of schooner William Thompson. (See Washington, D. C., United States Fish Commission.)

Olsen, Capt. George, and crew of schooner Willie M. Stevens. (See Washington, D. C., United States Fish Commission.)

Olsen, Capt. Thomas, and crew of schooner Epes Tarr. (See Washington, D. C., United States Fish Commission.)

Olsen, Capt. Thomas, and crew of schooner Polar Wave. (See Washington, D. C., United States Fish Commission.)

Oram, F. F. Specimens of minerals; from Alabama.

Overall, Capt. M. C. Small box of minerals; from Virginia.

Overton, B. F. Fragments of fossils, &c.; from Indian Territory.

Palmer, Dr. E. Box of ethnologica; from California.

Palmer, William. Specimens of living snakes; from Virginia.

Parks, Capt. Matthew, and crew of schooner Davy Crockett. (See Washington, D. C., United States Fish Commission.)

Parrish, W. J. A small collection of fossils; from Kansas City, Mo.

Patrick, Dr. J. J. R. Two casts of the "Cahokia mound," of Madison County, Illinois.

Pease, W. B. Collection of minerals, skull of swift, and heads and wings of two wild ducks; from New Mexico.

Peck, Dr. T. I. Stone muller and specimen of epidotic sienite; from Tennessee.

Peeples, William A., schooner Addison Center. (See Washington, D. C., United States Fish Commission.)

Peichardière, Prof. O. de la. A collection of birds' skins, nests, and eggs, reptiles, insects, and fishes; from Louisiana.

Perkins, E., of schooner Grace L. Fears. (See Washington, D. C., United States Fish Commission.)

Perry, J. A. Specimen of diatomaceous earth; from Punta de Lobos, Barbadoes.

Pettibone, William. Stone axe; from Maryland.

Phelps, W. W. Flint spear-head.

Philbrick, E. E. Specimens of phosphates; from Florida.

Pirz, Anthony. A large collection of chemicals and products derived from animal matter, canned meats, wax candles, albuminum, &c.

Pitts, A. Skeleton of turtle (*Emys guttata*) and skull of rodent.

Poey, Prof. Felipe. A living specimen of *Emys jamai*, Cope; from Cuba.

Polen, M. Root of herb used by the Indians of San Bernardino, Cal., for heart disease.

Poppelein Silicated Phosphate Company, Baltimore, Md.. Samples of infusorial earths, samples of fertilizers, &c.

Powel, Samuel. Specimen of lump-fish (*Cyclopterus lumpus*); from Newport, R. I.

Preston, R. E., Acting Director of Philadelphia Mint. Annual Assay Medal of 1879; obverse, H. R. Lindermann; reverse, tomb of Joseph Henry.

Proctor, G. H. Specimen of flounder; from the Squam River, Gloucester, Mass.

Pybas, Ben. Box of fossil plants from Alabama.

Quick, Edgar R. Specimens of field mice (*Synaptomys cooperi*); from Indiana.

Ragsdale, G. H. Collection of birds; from Texas.

Randle, Rev. E. H. Two specimens of minerals.

Rea, James H. Specimen of mineral.

Read, E. F. Box of Indian relics; from Alabama.

Reisinger, Lieutenant U. S. N. Fragments of Peruvian and Aztec pottery.

Reynolds, J. H. Specimens of silicified woods and a box of stone implements; from Tennessee.

Rhees, William H. Specimen of living snake and toad; Washington, D. C.

Rhees, William J. Living garter-snake (*Entænia sirtalis*) and toads (*Bufo americanus*); from Washington, D. C.

Rhodes, Thomas. Specimens of leaf-shaped stone implements; from Ohio.

Rhodes, W. E. Fossil shark's tooth; from marl beds near the Bigbee River, Alabama.

Richards, John H. Two boxes of living turtles (*Cistudo clausa* and *Chelopus insculptus*); from Pennsylvania.

Ridgway, Robert. Collections of birds; from Illinois, Florida, and Cobb's Island, Virginia.

Rison, John L. Two bottles of mineral water from Alabama.

Rodgers, John. (See Washington, D. C., United States Fish Commission.)

Roessler, A. R. Twelve boxes of stone implements and minerals; from Tennessee and North Carolina. (Deposited.)

Rogers, Thomas. Specimens of shells; from England.

Roper, Capt. R. I., of schooner Esther Ward. (See Washington, D. C., United States Fish Commission.)

Rose, G. W. Specimens of ozockerite; from Utah.

Rose, Capt. Medeo, and crew of schooner Hiram Powers. (See Washington, D. C., United States Fish Commission.)

Ruth, J. A. Small collection of Indian relics; from Bucks County, Pennsylvania.

Ruckley, Capt. Charles, of schooner Wm. A. Pew. (See Washington, D. C., United States Fish Commission.)

Ruckley, Charles, schooner Electric Flash. (See Washington, D. C., United States Fish Commission.)

Ruckley, Capt. Charles, of schooner Frederick Gerring, jr. (See Washington, D. C., United States Fish Commission.)

Rucker, James S. Two boxes of ethnologica; from Indiana.

Ryan, John J. (See Washington, D. C., United States Fish Commission.)

Ryan, Capt. Joseph, and crew of schooner David A. Story. (See Washington, D. C., United States Fish Commission.)

Ryan, Matt., of schooner Lizzie. (See Washington, D. C., United States Fish Commission.)

Ryan Matt., of schooner Seth Stockbridge. (See Washington, D. C., United States Fish Commission.)

Salvin, Prof. O. Eight species, nineteen specimens, of birds; from the Gallapagos Islands.

Sawyer, David, schooner Constitution. (See Washington, D. C., United States Fish Commission.)

Sawyer, R. J. Specimen of California salmon (*Oncorhynchus quinnat*); from Green Bay, Michigan.

Sayer & Fisher. Samples of adamantine bricks from New Jersey.

Schanno, Joseph. Bulbs of the wild *Camas;* from Washington Territory.

Schneck, Dr. J. Collection of living turtles (*Malacoclemmys geographicus, M. pseudogeographicus, Cistudo clausa*, &c.); from Illinois.

Schuermann, C. W. Pouch of opossum with fœtal young, bottle of reptiles, and a living specimen of the stink-pot (*Aromochelys odoratus*); from Texas.

Schurz, Hon. Carl, Secretary of the Interior. Collection of minerals.

Scott, George W., of schooner Edwin C. Dolliver. (See Washington, D. C., United States Fish Commission.)

Scott, George W., of schooner H. A. Durham. (See Washington, D. C., United States Fish Commission.)

Scott, George W., schooner Mary Story. (See Washington, D. C., United States Fish Commission.)

Scudder, Newton P. Skins of the bobolink and blue-bird; from New York; also large collection of sea birds, marine animals, &c.; from the Grand Banks.

Seiler, D. W. Two trout affected with worms in bladder.

Sellman, Henry. Box of different preparations of sardines.

Sharp, J. M. Fragments of human skulls; from mounds in Louisiana.

Shean, John, schooner Ida May. (See Washington, D. C., United States Fish Commission.)

Shemelia, James P., of schooner Wm. H. Raymond. (See Washington, D. C., United States Fish Commission.)

Shepherd, R. T. Specimens of arrow-heads and Silurian shells; from Ohio.

Sherman, Gen. W. T. Two specimens of silicified wood; from Arizona.

Shoemaker, Ernest. Living snake (*Ophibolus getulus and Eutænia sirtatis*); from Virginia.

Sill, J. M. B. Mounted specimen of bunting; from Michigan.

Slater, Senator James H. Samples of coal; from Oregon.

Slatery, G. A. Stone sinker; from Maryland.

Small, E. E. Humpback whale (*Megaptera*); from Provincetown, Mass. (Purchased.)

Smith, D. Living snake (*Bascanion constrictor*); from Georgetown, D. C.

Smith, Edwin W., schooner Storm King, of Provincetown. (See Washington, D. C., United States Fish Commission.)

Smith, Greene. A large collection of birds' skins.

Smith, Prof. H. L. Mounted diatoms. (Purchased.)

Smith, John P. Eleven arrow-heads; from Maryland.

Smith, Mrs. Ruth L. Stone pestle, lent for casting.

Smith, Capt. Sewell W., and crew of schooner S. R. Lane. (See Washington, D. C., United States Fish Commission.)

Snow A. Specimen of mineral; from Tennessee.

Southwick, J. M. K. Samples of fishing-tackle; from Rhode Island.

Spainhauer, J. M. Insect; from North Carolina.

Spalding, R. W., through Rev. F. B. Scheetz. Hematite celt; from Missouri.

Spangler, George. Fresh specimen of buffalo-fish.

Spencer, Senator George E. Two specimens of minerals.

Spurr, Capt. Alfred, and crew of schooner J. T. Wonson. (See Washington, D. C., United States Fish Commission.)

Stabler, James P. Specimens of living snakes (*Eutænia sirtatis, Ophibolus doliatus triangulus, O. getulus*) and owl (*Scops asio*); from Maryland.

Stacy, Fred. (See Washington, D. C., United States Fish Commission.)

Starr, Frederick. Box of minerals; from New York.

Stearns, Silas. Specimens of fish (*Seriola, Pimelepterus, Batrachus, Carangus, Trachynotus, Ophichthys*), and sponges; from Florida.

Steed, Augustus M. Specimen of insect.

Steedman, Dr. J. G. W. Specimen of catfish (*Amiurus nigricans*), weighing 150 pounds, and two perch (*Morone interrupta*); from the Mississippi River.

Steele, Hon. Walter L. Specimens of rosy quartz crystals.

Steere, Professor J. B. Box of ancient pottery; from Brazil.

Stevens, Levi. Two boxes coke; from Illinois.

Stevenson, James. Large stone pestle; from near Great Salt Lake, Utah.

Stokes, John H. An insect taken from a piece of ore 50 feet below the surface of the ground.

Story, Lieut. J. P., Signal Service, U. S. A. Piece of telegraph-wire melted and disintegrated by lightning; from Texas.

Stout, W. C. Stag-beetle; from Arkansas.

Statford, W. O. Beetle (*Dynastes hercules*); from North Carolina.

Sturm, Isaac. Worm found in Madeira vine, Alabama.

Sumichrast, Prof. F. Box of birds and reptiles; from Tehauntepec.

Sutton, John W. Modern Japanese bow and arrows.

Surveyor-General's Office, San Francisco, Cal. Box minerals; from California.

Swan, James G. Specimens of fishes and shells, fiber of common nettle used by the Makah and Quillehayte Indians for lines and fish nets; also smelt-net made of nettle-fiber; from Neeah Bay, Washington Territory.

Sweet, William. Specimens of minerals; from New York.

Sweet, Capt. William, of schooner Grace C. Hadley. (See Washington, D. C., United States Fish Commission.)

Swigert, Lieut. S. M., U. S. A. Three dried fish skins.

Syme, George B. Specimens of minerals; from Wyoming.

Symmes, Rev. Francis. Cast of Indian stone implement; from Indiana.

Tate, Benjamin H. Specimen of Gila monster (*Heloderma suspectum*); from Arizona.

Taylor, Will. H. Two boxes of stone relics; from Tennessee. (Purchased.)

Tasmania, Government of, through H. M. Hall, Hon. Secretary Royal Commission. Specimens of *Ornithorhynchus* and *Tachyglossus;* from Tasmania.

Teller, Hon. H. M. Specimens of nickel ore; from Colorado.

Temple, J. H. Worked pieces of porphyry designed for implements.

Tevis, J. B. Specimen of fish (*Tetrodon lævigatus*); from Delaware Bay.

Thetford, S. B. Specimens of mineral.

Thompson, C. H., passed assistant paymaster, U. S. N. Silver enameled cigar-case, match-box, and tray of Siamese workmanship; also portrait of H. R. H. Princess Sei Velay Larna received by Paymaster Thompson from the King of Siam.

Thompson, D'Arcy W. Pressed sertularian from Australia and New Zealand.

Thompson, Henry. Specimen of ore; from Utah.

Thompson, Capt. William, and crew of schooner Magic. (See Washington, D. C., United States Fish Commission.)

Thorpe, T. M. Two shad (*Alosa sapidissima*); from the Washita River, Arkansas.

Tibbets, J. H. Mineral; from Washington Territory.

Tokio, Japan, Mombusho Museum, Fujimaro Tauska, Director. A collection of minerals and fishes; from Japan.

Toner, Dr. J. M. Living alligator (*Alligator Mississippiensis*); from Florida.

Townshend, Smith, M. D. A green oyster; sent for examination.

Trevoy, Capt. Edward, and crew of schooner Proctor Brothers. (See Washington, D. C., United States Fish Commission.)

Tristram, Rev. H. B. Specimens of New Caledonian birds.

True, F. W. Specimens of living turtles and snakes; from Washington, D. C.

Tuggle, W. O. Stone implement; from Georgia.

Tuller, A. Eggs of mud hen; from California.

Turin, Italy, Royal Zoological Museum of Turin. A collection of mammals and reptiles, in alcohol; from Italy.

Turner, L. M. Twenty-five boxes of general natural history and ethnological collections; from Alaska.

Tyler, E. Specimens of herring; from Lake Ontario, New York.

Valentine, M. S. Stone ax; lent for casting.

Van Dyck, W. T. Parasite taken from Tamias.

Van Wyck, P. A. M. Specimens of fish (*Pomolobus mediocris and P. vernalis*); from the Hudson River.

Vaux, William S. Specimens of garnets and mica schist; from Fort Wrangel, Alaska.

Velie, Dr. J. W. Box of alcoholic specimens of Florida fishes and two ruddy ducks.

Vibert, Capt. John, and crew of schooner Argonaut. (See Washington, D. C., United States Fish Commission.)

Wadsworth, Capt. Thomas, and crew of schooner Conductor. (See Washington, D. C., United States Fish Commission.)

Walker, H. W. Specimen of mineral.

Walker, S. T. Sixteen boxes of birds, living and alcoholic reptiles, insects, birds' nests, human crania, and ethnological collections; from Florida.

Wallace, John. Mounted *Bassaricyon gabbii* (purchased).

Wallace, Rev. Peter. Indian stone ornament; (lent for casting).

Wallace, Rev. S. J. Small hematite celt; (lent for casting).

Waller, Mr. Specimen of duck; from Virginia.

Washington, D. C.:

Interior Department:

General Land Office. (See under the names of *Surveyors-General A. R. Hardenburg, R. C. Mason*, and *John Mason.*)

Navy Department:

Bureau of Steam Engineering. (See under the names of *Passed Assistant Engineers G. W. Baird* and *J. M. Emanuel.*)

Navigation Bureau, Capt. W. D. Whiting. Box of soundings made by the U. S. S. Essex, W. S. Schley commander, off the coasts of Africa and South America.

United States Navy. (See under the names of *Lieut. Commander H. Gorringe and Lieut. C. Belknap, G. M. Book, Capt. D. G. MacRitchie.*)

Treasury Department:

United States Mint, Philadelphia, Pa. Hon. R. E. Preston, acting director. Copies of the annual assay medal.

Washington, D. C.—Continued.

United States Commission of Fish and Fisheries. (*Prof. Spencer F. Baird, Commissioner.*) One hundred and forty-one packages zoological collections from Provincetown and Gloucester, Mass., and vicinity, put up by *Prof. A. E. Verrill*, *G. Brown Goode*, and *Tarleton H. Bean*. (See also under the names of *Charles G. Atkins*, *Tarleton H. Bean*, *H. C. Chester*, *F. N. Clark*, *Vinal N. Edwards*, *G. Brown Goode*, *James W. Milner*, and *Livingston Stone*.) Specimens have also been obtained by the Commission from the following parties:

Alden, Capt. Oscar W., and crew of the schooner Andrew Leighton. Rock covered with crustaceans and sea-anemone.

Allen, George K., schooner Gertie Foster. Portion of skull of black-fish.

Anderson, Capt. Charles, and crew of the schooner Alice G. Wonson. A large collection of corals (*Primnoa reseda*, *Paragorgia*, &c.), star-fishes, ascidians, barnacles, and rudder-fish (*Palinurichthys perciformis*).

Ardendale, Edward, schooner Sea Foam. Spiny spider-crab (*Lithodes maia*); from off Jeffrey's Ledge.

Brown, James, schooner David A. Osier. Living pipe-fish (*Siphonostoma*); from off Plymouth, Mass.

Burnham, E. K. Several very large cod and hake sounds.

Campbell, Capt. David, and crew of schooner Admiral. A collection of fishes (*Myxine glutinosa*, *Simenchelys parasiticus*, *Petromyzon marinus*, *Scopelus*, *Synaphobranchus pinnatus*, *Anarrhichas minor*), corals, sea-feathers, anemones, star-fishes, &c.; from the Grand Banks and Banquereau.

Cavanaugh, Capt. John, and crew of schooner Alfred Whalen. Rock covered with sponges and shells, hermit crabs, &c.; from George's Bank.

Collins, Capt. David E., and crew of schooner Gussie Blairsdell. Specimens of star-fish, sea-cucumbers, corals, bryozoans, &c., from George's Bank.

Collins, Capt. John and crew, schooner Albert H. Hasting. Specimens of fishes (*Phycis*, *Clupea*, *Trachurus*, *Prionotus*, *&c.*), beetles, lobsters, &c.; from off South Shoal light ship.

Collins, Capt. Joseph W., and crew of schooner Marion. A collection of fishes (*Somniosus*, *Synaphobranchus*, *Zoarces*, *Macrurus*, *Centroscyllium*, &c.) corals (*Alcyonium*, *Paragorgia*), star-fishes, sponges, &c.; from the Grand, George's, and Banquerean banks.

Critchett, Capt. John F., and crew of schooner Commonwealth. Specimens of corals (*Primnoa*, &c.), spider-crabs (*Lithodes*), and star-fishes; from George's Bank.

Crooks, Nathaniel, schooner Helen M. Dennis. Eggs of mollusk; from George's Bank.

Cunningham Capt. Augustus, schooner Geo. A. Upton. Sea-mouse (*Aphrodita*), taken from stomach of cod, caught off coast of Nova Scotia.

Curtis, Capt. George H., and crew of schooner Conductor. Specimens of corals (*Acanthogorgia*), sea-feathers, star-fishes, sea-anemones, &c.; from Banquereau.

Curzon, Captain, schooner Mist. Vertebra of whale; from Grand Banks.

Dodd, Andrew W. Jaw-bone of black-fish, taken on Coffin's Beach, Ipswich Bay.

Dolliver, Captain Peter and crew of schooner Grace L. Fears. Specimens of great northern sea-feather (*Pennatula borealis*), warty sea-rose (*Urticina*), fishes (*Synaphobranchus* and *Alepidosaurus*), &c.; from La Have Bank.

Douglass, Albert. Webb-fingered sea-robin (*Prionotus carolinus*); from off Norman's Woe.

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

Dyer, Captain, of Provincetown, Mass. Piece of skin, two teeth of sperm-whale, and tooth of alligator; from the West Indies.

Forbes, Maurice, schooner Eastern Light. A curious piece of perforated clay slate, in the shape of a horse's hoof, taken from Grand Bank.

Fowles, Frank, schooner Young Sultan. Specimens of fish (*Sebastes, Petromyzon, Anarrhichas, Leptoblennius,* &c.), star-fish, corals, sea-anemones, &c., from off Gloucester, Mass.

Fowles, Capt. M. V., and crew of schooner Young Sultan. Specimens of Norway haddock (*Sebastes*), sea-anemones, holothurians, &c., from off Gloucester, Mass.

Friend, George. Two specimens of split and dried leopard-fish (*Lopholatilus chæmeleonticeps*).

Friend, Samuel. Osseous growth, taken from head of fifty-pound codfish.

Getchell, Capt. John Q., and crew of schooner Otis P. Lord. Specimens of fish (*Sebastes, Ammodytes, Pomolobus, Cyclopterus, Squalus, Myxine, Prionotus, Clupea*), &c.; sponges, corals, crabs, sea-anemones, bryozoans, &c.; from Brown's and George's Banks.

Gill, Capt. Russell G., and crew of schooner Maud Gertrude. Large golden codfish, from Ipswich Bay, and flukes and part of the shank of an anchor of pattern used thirty years ago, covered with varieties of marine animals; taken off Gloucester, Mass.

Gilpatrick, Capt. Briggs, and crew of schooner Herbert M. Rodgers. Specimens of fish (*Alepidosaurus, Synaphobranchus, Myxine, Petromyzen, Centroscyllium,* &c.); corals (*Aconella*), sponges, sea-feathers, &c.; from Banquereau.

Gilpatrick, Capt. Gilman, schooner Seth Stockbridge. Stones covered with sponges and corals, and a crab; from Banquerean.

Goldsmith, J. B. Specimens of fungus (*Phallus impudicus*); from Rockport, Mass.

Goodwin, Capt. Thomas, and crew of schooner Howard. Specimens of fishes (*Centroscymnus, Chimæra, Synaphobranchus, Macrurus, Haloporphyrus, Myxine,* &c.); corals, star-fishes, sponges, sea-feathers, anemones, &c.; from Grand Banks.

Gorman, Capt. John, and crew of schooner Geo. S. Boutwell. Specimens of fishes (*Lophopsetta, Scomberesox, Hemitripterus*), hermit crab, and a large sea-mouse (*Aphrodita*); from Western Bank.

Gourville, Capt. John, and crew of schooner Rebecca Bartlett. Specimens of fishes (*Zoarces, Muræenoides, Liparis*), corals, anemones, hydroids, bryozoans, &c.; principally from George's Bank.

Gott, Addison. Rock, taken from George's Bank in 1876 by schooner Rival.

Greenleaf, Capt. Nathaniel, and crew of schooner Grace L. Fears. Specimens of fishes (*Macrurus, Centroscyllium, Anarrhichas*), &c., corals, star-fishes, sponges, sea-feathers, &c.; from Banquereau and the Grand Banks.

Greenleaf, Capt. Thomas F., and crew of schooner Chester R. Lawrence. Specimens of corals (*Paragergia* and *Keratoisis*), star-fishes (*Asterias stellionura*) sponges, hydroids, &c.; from Banquereau.

Greenwood, Captain, and crew of schooner Sultana. Specimens of crabs, lobsters, corals, sponges, sea-lemons (*Boltenia*), and sea-cucumbers (*Pentacta*); from Clark's Bank.

Hamlin, Capt. Peter, and crew of schooner Andrew Leighton. Specimens of corals and fishes; from Banquereau.

Herrick, Capt. William, schooner Augusta Herrick. Specimens of *Hypsiptera argentea*, found on deck while dressing mackerel; lance (*Ammodytes*), &c.; from George's Bank.

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

Hodgdon, Capt. Thomas, and crew, of schooner Bessie W. Somes. Specimens of sea-feathers (*Pennatula borealis* and *Balticina Finmarchica*) and sea-anemones; from the Grand Banks.

Hodgdon, Capt. W. F., and crew, of schooner Procter Brothers. Specimens of fishes (*Synaphobranchus* and *Petromyzon*), corals (*Acanthogorgia, Paragorgia*), sea-feathers, &c.; from Western Bank.

Holbrook, Joseph E., schooner Jennie T. Phillips. Specimen of cramp or torpedo fish (*Torpedo occidentalis*), weighing 250 pounds; taken ten miles south of Gloucester, Mass.

Hoy, George W., schooner Mary F. Chisholm. A very beautiful specimen of great tree-coral (*Paragorgia arborea*), nearly five feet high and three feet broad, and some basket star-fish (*Astrophyton*); from the Grand Banks.

Hoyt, Edward F. A specimen of pipe-fish (*Siphonostoma*).

Hoyt, W. E. Specimen of sea-bass (*Centropristris*); taken in weir off Norman's Woe.

Hurlbert, Capt. R. H., schooner Sultana. Specimens of shells, hydroids, bryozoans, ascidians, holothurians, &c.; from George's Bank.

Hurlbert, Capt. William, schooner Franklin S. Scheck. Specimen of finger-sponge (*Chalina*); from off Sankoty Head, Mass.

Johnson, Capt. Benjamin, schooner Alaska. Specimens of sea-mice (*Aphroditea*); from George's Bank.

Johnson, Capt. Charles, schooner Lucille Curtis. Specimens of crabs (*Neptunus Sayi*); from N. lat. 20° 45′, W. long. 61° 32′; shrimps from N. lat. 25° 14′, W. long. 59° 33′; also specimens of fish from South America and the West Indies.

Johnson, Capt. Christian, schooner William Thompson. A specimen of fish new to science (*Alepocephalus bairdii*); from the Grand Banks.

Johnson, Capt. George A., and crew, of schooner Augusta Johnson. Specimens of fishes (*Macrurus Fabricii, M. bairdii, Scomberesox, Centroscymnus, Centroscyllium, Macrurus rupestris, Synaphabranchus*), corals, sponges, sea-feathers, &c.; from Banquereau.

Johnson, Capt. Otis, schooner Helen M. Dennis. Specimen of finger-sponge (*Chalina*); from Brown's Bank.

Johnson, Capt. P., schooner John Smith. Specimen of lamper-eel (*Petromyzon*), sea-corn (eggs of *Buccinum*); from Brown's Bank.

Kirby, Capt. William, schooner Wm. V. Hutchings. Specimens of important food fish new to science (*Lopholatilus chamæleonticeps*); from off Noman's Land; and ghost-fish (*Cryptacanthodes*), barnacles, star-fishes, sea-anemones, &c.; from George's Bank.

Lee, Thomas. A very rare squid (*Loligopsis pavo*); from the edge of the Gulf Stream.

Ligsworth, Capt. John E., and crew, of schooner Mary Story. Specimens of sponge (*Phakellia*) and hydroids attached to rock; from La Have Bank.

Low, John. A large branch of tree-coral (*Primnoa reseda*); from George's Bank.

Lurvey, William. Specimens of sea-corn (eggs of *Buccinum*).

McCalib, Vinal. A young blue-fish (*Pomatomus saltatrix*); from Gloucester Harbor.

McCauley, Mr., schooner Wachusett. Specimens of fishes (*Synaphabranchus* and *Myxine*), sea-feathers (*Pennatula, Balticina*), corals (*Acanella, Keratoisis*), star-fishes, &c.; from Banquereau.

McCormack, Capt. John, and crew, of schooner Wachusett. Specimens of tree-coral (*Paragorgia arborea*), sea-feather (*Balticina Finmarphica*), basket-fish (*Astrophyton*), sea-anemones, sponges, &c.; from Banquereau.

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

McDonald, Capt. James, and crew, of schooner Magic. Specimens of corals (*Acanella, Flabellum*), sponges (*Phakellia*), sea-cauliflowers, &c.; from Grand Banks.

McDonald, Capt. James, and crew, of schooner Willie M. Stevens. Specimens of fishes (*Scomberesox*), basket-fish (*Astrophyton*), &c.; from La Have Bank.

McDonald, Lewis. A large perforated rock covered with hydroids and bryozoans; from North Bay.

McDonald, Capt. William, and crew, of schooner N. H. Phillips. Specimens of fishes (*Lycodes, Macrurus*), corals, sponges, &c.; from Grand Banks.

McEachern, Daniel, schooner Rutherford B. Hayes. Two chicken-halibut (*Hippoglossus vulgaris*), from Jeffrey's Bank, and two small flying-fish (*Exocœtus*).

McEachern, Daniel, schooner Guy Cunningham. Specimens of fishes (*Macrurus, Scopelus, Myxine*), sea-feathers, star-fish, corals, sponges, &c.; from the Grand Banks.

McGraw, Philip. A small stickle-back (*Gasterosteus pungitius*); from Gloucester Harbor.

McInnis, Capt. John, and crew, of schooner M. H. Perkins. Specimens of fishes (*Ammodytes, Myxine, Synaphobranchus*), sea-feathers (*Virgularia, Pennatula*), star-fishes (*Asterias, Hippasterias*), sponges, anemones, &c.; from off Newfoundland, Sable Island, and La Have.

McIntosh, Capt. Colin, and crew, of schooner Nathaniel Webster. Specimens of fishes (*Synaphobranchus*), sea-feathers (*Pennatula*), warty sea-rose (*Urticina*), corals (*Acanella*); from Western Bank.

McKinnon, Capt. Daniel, and crew, of schooner Mary F. Chisholm. Specimens of fishes (*Myxine*), corals (*Primnoa, Alcyonium, Flabellum*), sponges, star-fishes, sea-anemones, &c.; from Banquereau.

McKinnon, Capt. John, and crew, of schooner Rutherford B. Hayes. Specimens of fishes (*Sebastes, Cyclopterus, Myxine, Zoarces, Merlucius, Cryptacanthodes, Melanogrammus, Hippoglossus*, &c.), star-fishes (*Asterias, Ctenodiscus*), worms, crustaceans, &c.; from George's Bank.

McKinnon, Capt. John, and crew, of schooner Ivanhoe. A small devil-fish (*Octopus bairdii*); from Jeffrey's Ledge.

McKinnon, Thomas. A specimen of American sole (*Achirus lineatus*); from Brown's Bank.

McPhee, Capt. Neil, and crew, of schooner Carl Schurz. Specimens of coral (*Acanella*), sea-feather (*Balticina*), sea-rose (*Urticina*), anemones, &c.; from Banquereau.

Mansfield, James, and sons. Specimens of cod-fish, with small fish imbedded in flesh; from Grand Banks.

Marchant, Capt. Jabez. Portion of jaw of shark, with teeth.

Markuson Capt. K., and crew, of schooner Notice. Specimens of fishes (*Macrurus*), corals, sea-feathers, star-fishes, shells, &c.; from Banquereau.

Martin, Capt. Charles, and crew, of schooner Martha C. A fine specimen of honey-comb coral, from off Cape Negro, N. S.; and rock-eel (*Murænoides gunnellus*); from Gloucester Harbor.

Martin, Capt. George H., and crew, of schooner Northern Eagle. Specimens of fishes (*Zoarces, Raia, Seriola, Cyclopterus*, &c.), star-fishes, &c.; from Ipswich Bay.

Merchant, George. Specimen of cake-urchin (*Echinachnius parma*), from Narragansett Bay; also specimens of quartz and mica, &c., from Barnegat.

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

Merchant, Orlando. A perfect specimen of rock-eel (*Murænoides gunnellus*).

Merchant, Capt. Phillip, and crew, of schooner Marion. Specimens of fishes (*Synaphobranchus, Anarrhichas, Macrurus, Myxine, Stomias, Chimæra,* &c.), corals, sponges, star-fishes, anemones, &c.; from Banquereau and the Grand Banks.

Morrissey, Capt. James D., and crew, of schooner Plymouth Rock. Specimens of fishes (*Haloporphyrus, Centroscyllium*) corals, star-fishes, sponges, sea-feathers, &c.; from Grand Banks.

Morrissey, Capt. James D., and crew of schooner Alice M. Williams. Specimens of fishes (*Sebastes, Scopelus*), sea-feathers (*Balticina*), and basket star-fish; from the Grand Banks.

Morrison, Capt. R. L., and crew, of schooner Laura Nelson. Specimens of slime-eels (*Myxine glutinosa*), corals (*Alcyonium*), sea-anemones, &c.; from the Grand Banks.

Moulton, Capt. Charles V., and crew, of schooner Peter D. Smith. Specimens of fishes (*Squalus, Prionotus, Petromyzon, Centroscyllium, Centroscymnus, Synaphobranchus*), corals (*Primnoa, Paragorgia, Acanella, Acanthogorgia, Alcyonium,* &c.), sponges, &c.; from George's and Clark's Banks.

Murphy, Capt. C. D., and crew, of schooner Alice M. Williams. A collection of corals (*Alcyonium, Primnoa, Keratoisis, Acanella*), sea-feathers, star-fishes, lamp-shells, anemones, &c.; from the Grand Banks.

Murphy, Capt. Thomas, and crew, of schooner William H. Oakes. Specimens of slime-eel (*Myxine glutinosa*), bush-coral (*Primnoa reseda*), sea-feathers (*Balticina Finnmarchica*), and basket star-fish; from Banquereau.

Nelson, Capt. Andrew, schooner Carlton. Rock covered with bryozoans and barnacles, and a finger-sponge (*Chalina*); from Brown's and George's Banks.

Nickerson, Capt. James, and crew, of schooner Commonwealth. Specimens of fishes (*Synaphobranchus, Myxine*), sea-feathers, sponges, sea-anemones, &c.; from the Grand Banks.

Nickerson, Capt. James, and crew, of schooner Bellerophon. Specimens of bush-coral (*Acanella Normani*), sea-feathers (*Pennatula borealis*), warty sea-rose (*Urticina*), and shells; from La Have Bank.

Norwood, Ferdinand. Specimens of sea-robin (*Prionotus carolinus*); caught off Rockport, Mass.

Olsen, Capt. Christian, and crew, of schooner William Thompson. Four alcyonium corals, tube-making actiniana (*Cerianthus borealis*), and a number of basket star-fish; from Grand Banks.

Olsen, Capt. George, and crew, of schooner Willie M. Stevens. Specimens of fishes (*Palinurichthys, Simenchelys, Anarrhichas, Synaphobranchus, Petromyzon, Scopelus,* &c.), corals (*Flabellum Goodei*), sea-feathers (*Pennatula*), star-fishes, &c.; from Banquereau.

Olsen, Capt. Thomas, and crew, of schooner Epes Farr. Specimens of fishes (*Cyclopterus, Simenchelys, Synophabranchus,* &c.), corals (*Primnoa, Keratoisis, Paragorgia*), sea-feathers (*Pennatula, Balticina*), star-fishes, anemones, &c.; from Banquereau.

Olsen, Capt. Thomas, and crew, of schooner Polar Wave. Specimens of pug-nosed eels, eggs of *Buccinum*, sea-feathers (*Pennatula borealis*) and anemones; from the Grand Banks.

Parks, Capt. Matthew, and crew, of schooner Davy Crockett. Specimens of fishes (*Synaphobranchus*), sea-mice (*Aphrodytes*), crabs, worms, &c.; from the Grand Banks.

Peeples, William A., and crew, of schooner Addison Center. Specimens of fishes (*Synaphobranchus, Simenchelys*), corals (*Keratoisis, Paragorgia, Acanella*),

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

sponges, sea-feathers (*Pennatula*), shells (*Terebratulina, Neptunea*), anemones, &c.; from Banquereau.

Perkins, E., schooner Grace L. Fears. Specimens of fishes (*Myxine, Eumicrotremus*), star-fishes (*Asterias, Hippasterias*, &c.), corals, sponges, sea-feathers, anemones, &c.; from the Grand Banks.

Rodgers, John. A living hair-worm (*Gordius*).

Roper, Capt. R. I., schooner Esther Ward. Rock covered with shells, barnacles, and hydroids; from George's Bank.

Rose, Capt. Medeo, and crew, of schooner Hiram Powers. Specimen of Norway haddock (*Sevastes marinus*); from Jeffrey's Bank.

Ruckley, Charles, schooner Electric Flash. Specimens of fishes (*Cyclopterus, Phycis, Lophopsetta, Gasterosteus*), squid (*Ommastrephes*), and sand-fleas; from off Seguin Light, Maine.

Ruckley, Charles, schooner Frederic Gerring, jr. Specimens of slime-eels (*Myxine glutinosa*), corals, sponges, crustacea, star-fishes, &c.; from the Grand Banks.

Ruckley, Capt. Charles, schooner William A. Pew. Rock covered with shells, hydroids, and bryozoans; from George's Bank.

Ryan, John J. Perforated rock; from George's Bank.

Ryan, Capt. Joseph, and crew, of schooner David A. Story. Specimens of sponges, (*Phakellia*, &c.); from the Grand Banks.

Ryan, Matthew, schooner Lizzie. Specimens of fishes (*Scopelus*), star-fishes, corals, and two tube-making actinias; from the Grand Banks.

Ryan, Matthew, schooner Seth Stockbridge. Specimens of sea-anemones, sea-feathers (*Pennatula borealis*), &c.; from Green Bank.

Sawyer, David, schooner Constitution. Ovaries of blue-shark; from Middle Bank.

Scott, George W., schooner Edwin C. Dolliver. Specimens of fishes (*Macrurus, Synaphobranchus*, &c.), sea-feathers (*Pennatula borealis, P. aculata, Balticina Finnmarchica*), craw-fishes, star-fishes, shells, &c.; from Sable Island Bank.

Scott, George W., schooner, H. A. Duncan. Specimens of fishes (*Macrurus, Sebastes, Haloporphyrus, Centroscyllium, Myxine*), corals, sea-feathers, sponges, &c.; from the Grand Banks.

Scott, George W., schooner Mary Story. Specimens of fishes (*Sebastes, Orcynus, Lophopsetta, Achirus, Pomatomus*), shells (*Pecten, Modiola, Cyrptodaria*, &c.), crustacea, sponges, hydroids, worms, &c.

Shean, John, schooner Ida May. Specimens of herring (*Clupea harengus*); from off Norman's Woe.

Shemelia, Joseph P., schooner Wm. H. Raymond. Specimens of fishes and shells; from George's Bank.

Smith, Edwin, W., schooner Storm King. Specimens of coral, sea-fan (*Gorgonia*), and plastrons of large turtles; from Grand Cayman, West Indies.

Smith, Capt. Sewell W., and crew, of schooner S. R. Lane. Specimens of fishes (*Petromyzon, Myxine, Synaphobranchus, Haloporphyrus*, &c.), corals (*Alcyonium, Acanthogorgia*, (star-fishes) *Crossaster*, &c.), sea-feathers (*Virgularia, Balticina*), anemones, &c.; from the Grand Banks and other localities.

Spurr, Capt. Alfred, and crew, of schooner J. F. Wonson. Specimens of star-fishes, anemones, ascidians, hydroids, &c.; from off Chatham Island, Mass.

Stacy, Fred. A large smelt (*Osmerus mordax*), taken in Squam River.

Sweet, Capt. William, schooner Grace C. Hadley. Specimens of fishes (*Sebastes*), star-fishes, sponges, crabs, shells, &c.; from George's and Brown's Banks.

Washington, D. C.—Continued.

U. S. Commissioner of Fish and Fisheries—Continued.

Thompson, Capt. William, and crew, of schooner Magic. Specimens of capelin (*Mallotus villosus*), sea-feathers (*Pennatula, Virgularia*), corals, star-fishes, &c.; principally from Banquereau.

Trevoy, Capt. Edward, and crew, of schooner Procter Brothers. Specimens of sea-anemones and barnacles; from Grand Banks.

Vibert, Capt. John, and crew, of schooner Argonaut. Specimens of sponges, shells, bryozoans, crustaceans, &c.; from the Grand and Western Banks.

Wadsworth, Capt. Thomas, and crew, of schooner Conductor. Specimens of Norway haddock (*Sebastes marinus*), and a perfect individual of a rare fish (*Scopelus* sp.), that was washed on board the vessel; from the Grand Banks.

Wells, Capt. Michael, schooner Water Spirit. Specimens of star-fishes and sea-spiders; from Western Bank.

Williams, Frank. A fine specimen of bill-fish (*Scomberesox saurus*); from the Squam River.

Wilson, Charles. Egg-cases of the shell-fish (*Sycotypus canaliculatus*); from Providence River.

Wilson, Henry, schooner Flash. Specimens of boring-sponge, sea-anemones, warty sea-rose, (*Urticina*), star-fishes, shells, and three Kittiwake gulls, (*Rissa tridactyla*); from the Grand Banks.

Wilson, John J., schooner Polar Wave. Specimens of fishes (*Centroscyllium, Centroscymnus, Synaphabranchus, Lycodes,*) corals (*Primnoa, Paragorgia, Acanthogorgia, Acanella, Alcyonium, Anthromastus*), star-fishes, sponges, anemones, &c.; from George's Bank.

Wonson, Everett P. A fine collection of several varieties of bryozoans (*Flustra, &c.,*) taken by schooner Reporter on the Grand Banks; also a rare holothurian from off Gloucester.

Wonson, John F. A large boulder covered with bryozoans, shells, hydroids, sponges, &c.; from George's Bank.

Wonson, Samuel G., schooner John S. McQuinn. Specimens of fishes, (*Phycis, Palinurichthys, Lophius, Squalus, Petromyzon*), and samples of mackerel-food (*Scomber scombrus*), taken off the coasts of Maine and Massachusetts.

Woodbury, Capt. J., schooner Barracouta. Rock covered with barnacles, hydroids, sponges, and shells from the George's Bank.

War Department:

Signal Service. (See under the names of *Privates E. W. Nelson* and *L. M. Turner*.

Surgeon-General's Office, Army Medical Museum. Specimen of snake from Fort Davis, Tex. (See also under the names of *Drs. R. T. Burr, Elliott Coues, B. J. D. Irwin,* and *Hospital Steward A. Gecks.*

Surveys west of the one-hundredth meridian (*Capt. G. M. Wheeler in charge*). Sixty-four boxes of minerals and volcanic rocks; a large collection of birds' skins, eggs, and nests; specimens of mammals, fishes, reptiles, and insects.

United States Army. (See under the names of *General W. T. Sherman, General M. C. Meigs, Col. A. G. Brackett, Lieuts. H. Metcalfe, S. M. Swigert, J. P. Jefferson.*)

Wasson, Hon. John, surveyor-general Arizona. Specimens of minerals of various mines in Pinal, Pima, and Yamapai Counties, Arizona.

Wayman, J. F. Small box of fossils from West Virginia.

Webb, John S. Specimens of shells from Kentucky.

Weigel, John. Specimen of hair-snake (*Gordius aquaticus.*)

Wells, Capt. M. and crew, of schooner Water Spirit. (See Washington, D. C., United States Fish Commission.)

Wheatley, Charles M. Specimens of minerals.

Wheeler, Capt. George M., U. S. A. (See Washington, D. C., survey west of the one hundredth meridian.)

Wheeler, L. R. Specimen of mineral.

Whitney, Oscar M. Catlinite figure-pipe (lent for casting).

Widman, Otto. Nests and eggs of *Empidonax traillii* and *E. acadicus.*

Wilkinson, E., Jr. Box of beetles; from Central and South America.

Willcox, Joseph. A box of minerals; from Pennsylvania. Crystals of staurolite; from Georgia.

Williams, Charles. Living snake (*Cyclophis æstivus*).

Williams, Rev. C. Foster. Collection of stone relics (lent for examination)

Williams, Frank, through Procter Brothers. (See Washington, D. C., United States Fish Commission.)

Williams, Joseph. Malformed hen's egg.

Wilson, Charles. (See Washington, D. C., United States Fish Commission.)

Wilson, Henry, schooner Flash. (See Washington, D. C., United States Fish Commission.)

Wilson, John I., schooner Polar Wave. (See Washington, D. C., United States Fish Commission.

Wilson, R. A. Specimens of minerals; from Ohio.

Wiltheiss, C. T. Two inscribed tablets; from Ohio.

Windom, Senator William. Specimens of ore; from Minnesota.

Wingate, Dr. J. D. Specimens of fossils; from Pennsylvania.

Woltz, Willie. Specimens of fish (*Acipenser oxyrhynchus* and *Lepidosteus osseus*); from the Potomac River.

Wonson, Everett P. (See Washington, D. C., United States Fish Commission.)

Wonson, John F. (See Washington, D. C., United States Fish Commission.)

Wonson, Samuel S., schooner John S. McQuinn. (See Washington, D. C., United States Fish Commission.)

Woodbery, Capt. J., schooner Barracouta. (See Washington, D. C., United States Fish Commission.)

Woodbury, Eldridge. Specimen of vertebræ of whale; from Massachusetts.

Wood, John E. Specimen of soapstone; from Virginia.

Wood, Preston. Specimens of stone relics; from Illinois.

Woodward, A. J. Specimens of living snakes and skins of rattlesnake *Crotalus adamanteus*); from Florida.

Wooldridge, George. Tail of ray; from Florida.

Wooldridge, Mrs. Two small living alligators; from Florida.

Wooster, A. F. Specimens of birds' nests and eggs, and arrow-heads.

Worthen, C. K. Two boxes of birds' skins.

Yarrow, Dr. H. C., U. S. A. Living snake (*Heterodon platyrhinus*), from New Jersey.

Yates, Dr. L. G. Human crania, &c., from cave in Alameda County, California.

Zimmerman, G. W., through F. G. Galbraith. Carved stone head of Indian design; from Pennsylvania.

Unknown. Specimens of minerals from Virginia, Georgia, &c.; specimens of fish (*Raia* and *Diodon*); two living owls (*Bubo virginianus*); arrow-heads, celts, &c.; insects, cocoons, &c., and plants.

STATISTICS OF EXCHANGES.

BOXES SENT ABROAD IN 1879.

Country.	Smithsonian exchanges.	Government exchanges.	Total.
AMERICA.			
Argentine Confederation	3	2	5
Bahamas	1	......	1
Barbadoes	2	......	2
Brazil	3	1	4
British Guiana	1	......	1
Canada*	......	2	2
Chili	2	1	3
Costa Rica	1	......	1
Cuba	3	......	3
Ecuador	3	......	3
Guatemala	1	......	1
Hayti	......	1	1
Jamaica	1	......	1
Mexico	4	1	5
St. Thomas	1	......	1
Trinidad	2	......	2
Uruguay	1	......	1
United States of Colombia	1	......	1
Venezuela	1	1	2
West Indies	1	......	1
ASIA.			
Japan	2	1	3
AUSTRALIA.			
New South Wales	2	1	3
New Zealand	3	1	4
Queensland	......	1	1
South Australia	1	1	2
Tasmania	......	1	1
Victoria	2	1	3
EUROPE.			
Belgium	5	1	6
Denmark	4	10	14
France	29	11	40
Germany and Austria	63	14	77
Great Britain	52	......	52
Greece	2	1	3
Italy	13	......	13
Netherlands	7	1	8
Norway	3	1	4
Portugal	3	1	4
Russia	10	......	10
Spain	3	1	4
Sweden	7	1	8
Switzerland	7	1	8
Turkey	1	1	2

RECAPITULATION.

America	32	9	41
Asia	2	1	3
Australia	8	6	14
Europe	209	44	253
Total	251	60	311

* The list of Smithsonian exchanges for Canada is contained in the report on domestic exchanges.

NOTE.—Number of boxes, 311; bulk in cubic feet, 2,177; weight in pounds, 69,975; containing 14,659 miscellaneous packages, of which 25 contained specimens of natural history.

PACKAGES RECEIVED BY THE SMITHSONIAN INSTITUTION FROM EUROPE ETC., FOR DISTRIBUTION IN AMERICA.

	1879.
ALABAMA.	
Tuscaloosa:	
Alabama University	1
Geological Survey of Alabama	2
ARIZONA.	
Prescott:	
Territorial Library	2
ARKANSAS.	
Holly Grove:	
Literary Institute	1
Little Rock:	
Governor of Arkansas	4
State Library	8
CALIFORNIA.	
Oakland:	
University of California	22
Sacramento:	
Agricultural and Horticultural Society	3
Medical Society of California	1
State Agricultural Society	2
State Library	2
San Francisco:	
Academy of Sciences	105
California Historical Society	1
Mercantile Library Association	1
Geological Society	2
Geological Survey of California	6
Stockton:	
Society of Natural History	5
COLORADO.	
Denver:	
Agricultural Society	1
Governor of Colorado	2
Territorial Library	2
Golden:	
School of Mines	2
CONNECTICUT.	
Hartford:	
Board of Agriculture	1
Connecticut Society of Natural History	1
State Agricultural Society	1
Young Men's Institute	1
Middletown:	
Wesleyan College	2
New Haven:	
American Journal of Arts and Sciences	72
American Oriental Society	39
Connecticut Academy of Sciences	164
Sheffield Scientific School	2
State Board of Agriculture	2
Yale College	27
Yale College Observatory	1
DISTRICT OF COLUMBIA.	
Georgetown:	
Georgetown College	5
Georgetown College Observatory	2
Washington:	
Agricultural Department	119
American Medical Association	37
Army Medical Museum	6
Botanic Garden	1
Coast Survey	53
Census Bureau	11
Columbian University	2
Construction, Bureau of	1
DISTRICT OF COLUMBIA—Continued.	
Washington—Continued.	
Corporation of city	1
Education, Bureau of	21
Engineer Bureau	12
Entomological Commission	1
Geological Survey of the Territories	100
Governor of the District of Columbia	1
Hydrographic Office	16
Indian Commissioners	3
Interior Department	19
Land Office	3
Library of Congress	30
Light-House Board	7
Marine Hospital	2
Mint, Director of	6
National Academy of Sciences	103
National Museum	1
Nautical Almanac	11
Naval Observatory	60
Navigation, Bureau of	7
Navy Department	9
Ordnance Office	5
Patent Office	51
Philosophical Society	3
Provost-Marshal-General	1
Signal Office	40
Spencerian Business College	1
State Department	6
Statistics, Bureau of	20
Surgeon-General's Office	65
Treasury Department	11
War Department	12
Washington Sentinel	1
FLORIDA.	
Tallahassee:	
Academy of Tallahassee	1
GEORGIA.	
Savannah:	
Historical Society of Georgia	4
Atlanta:	
City Library	1
ILLINOIS.	
Carbondale:	
Southern Illinois Normal University	1
Chicago:	
Academy of Science	108
American Electrical Society	1
Astronomical Society	8
Board of Trade	1
Dearborn Observatory	2
Free Library	4
Museum of Natural History	3
Observatory	9
Public Library	31
Society of Natural History	2
University	1
State Microscopical Society	1
Galesburg:	
Academy of Music	1
Lombard University	8
Moro:	
American Pomological Society	5
Normal:	
State Natural History Society	15
Rock Island:	
Augustana College	1
Springfield:	
Geological Survey	2
State Board of Agriculture	1
State Library	1

	1879.
INDIANA.	
Greencastle:	
Asbury University	1
Indianapolis:	
Academy of Science	7
Geological Society	1
Geological Survey of Indiana	6
Indiana Historical Society	2
Public Library	1
Richmond:	
Richmond Scientific Association	1
IOWA.	
Davenport:	
Academy of Natural Sciences	100
Decorah:	
Norwegian Lutheran College	5
Des Moines:	
Governor of Iowa	4
State Horticultural Society	2
State Library	1
State University	1
Dubuque:	
Iowa Institute of Science and Arts	7
Iowa City:	
State Historical Society	2
State University	17
KANSAS.	
Leavenworth:	
Kansas Academy of Music	1
Kansas State Academy of Science	1
Topeka:	
Kansas Historical Society	21
KENTUCKY.	
Frankfort:	
Geological Survey of Kentucky	5
Louisville:	
Historical Society of Kentucky	1
Public Library	3
Russelville:	
Logan Female College	1
LOUISIANA.	
Baton Rouge:	
State University	3
New Orleans:	
New Orleans Academy of Science	50
State Library	4
MAINE.	
Augusta:	
Commissioner of Fisheries	2
Historical Society of Maine	2
Brunswick:	
Bowdoin College	4
Lewiston:	
Androscoggin Natural History Society	1
Norway:	
High School and Academy	2
Portland:	
Portland Society of Natural History	42
Saco:	
York Institute	1
Waterville:	
Colby University	6
MARYLAND.	
Annapolis:	
Saint John's College	1
United States Naval Academy	1
Baltimore:	
American Journal of Mathematics	2
Academy of Sciences	8
Historical Society of Maryland	4
Johns Hopkins University	22
Mercantile Library	1
Peabody Institute	13
Superintendent Public Instruction	1

	1879.
MASSACHUSETTS.	
Amherst:	
Astronomical Observatory	1
College Library	1
Massachusetts Agricultural College	1
Boston:	
Agricultural Society	1
American Academy of Arts and Sciences	228
American Gynaecological Society	2
American Statistical Association	1
Art Museum	1
Boston Medical and Surgical Association	1
Boston Observatory	1
Boston Society of Natural History	314
Boston University	1
Bowditch Library	2
Commonwealth of Massachusetts	2
City Library	1
Library of Boston Hospital	2
Massachusetts Historical Society	3
Massachusetts Horticultural Society	1
Massachusetts Institute of Technology	2
Massachusetts State Board of Agriculture	3
Massachusetts State Board of Charities	1
Massachusetts State Board of Health	6
Massachusetts State Library	13
Medical and Surgical Journal	14
New England Historical and Genealogical Society	3
Public Library	48
Sanitary Commission	1
Sanitary Institute	1
Worcester County Horticultural Society	1
Cambridge:	
Entomological Club	1
Harvard College	59
Harvard College Observatory	33
Lawrence Scientific School	1
Museum of Comparative Zoology	135
Peabody Museum	15
Jamaica Plain:	
Bussey Institution	9
Leicester:	
Public Free Library	1
Manchester:	
Literary and Philosophical Society	1
Penekese Island:	
Anderson School	1
Salem:	
American Association for the Advancement of Science	58
Essex Institute	111
Peabody Academy	131
Wellesley:	
Wellesley College	1
Worcester:	
American Antiquarian Society	13
Technological Institute	1
MICHIGAN.	
Ann Arbor:	
Geological Survey of Michigan	3
Observatory	16
University of Michigan	9
Coldwater:	
Michigan Library Association	6
Detroit:	
Geological Survey of Michigan	1
State Agricultural Society	15
Lansing:	
State Agricultural Society	1
State Board of Health	29
State Library	2
MINNESOTA.	
Minneapolis:	
Minnesota Academy of Sciences	18
Saint Paul:	
Academy of Natural Sciences	3
Chamber of Commerce	1
Minnesota Historical Society	8

	1879.
MISSOURI.	
Columbia:	
Geological Survey of Missouri	3
University of Missouri	10
Jefferson:	
Geological Survey of Missouri	8
Governor of Missouri	2
Historical Society of Missouri	1
State Board of Agriculture	4
Kansas City:	
Western Review of Science and Industry	1
Rolla:	
Missouri School of Mines	1
Saint Louis:	
Academy of Sciences	169
Mercantile Library	3
Polytechnic Department of the Washington University	1
Public School Library	2
University	2
NEW HAMPSHIRE.	
Concord:	
New Hampshire Historical Society	4
New Hampshire State Lunatic Asylum	1
Hanover:	
Dartmouth College	3
Observatory	1
NEW JERSEY.	
Burlington:	
Geological Survey of New Jersey	1
Hoboken:	
Stevens Institute of Technology	8
Mount Holly:	
Burlington County Lyceum of History and Natural Sciences	1
Newark:	
Historical Society of New Jersey	1
New Brunswick:	
Geological Survey of New Jersey	4
Rutger's Scientific School	1
Princeton:	
College of New Jersey	22
Green School of Science	1
NEW YORK.	
Albany:	
Albany Institute	13
Adirondack Survey Office	4
Dudley Observatory	18
Governor of New York	1
New York Literary Society	1
New York Medical Society	1
New York Museum of Natural History	7
New York State Agricultural Society	44
New York State Cabinet of Natural History	1
Regents of New York University	5
State Library	58
Brooklyn:	
Brooklyn Library	1
Long Island Historical Society	1
Buffalo:	
Buffalo Historical Society	1
Buffalo Society of Natural Sciences	99
Observatory	1
Clinton:	
Hamilton College Observatory	4
Ithaca:	
Cornell University	10
New York City:	
Academy of Sciences	142
American Agriculturist	1
American Chemical Society	10
American Chemist	7
American Ethnological Society	6
American Geographical Society	89
American Institute	30
American Institute of Architects	7
American Journal of Microscopy	1
American Naturalist	1
American Public Health Association	2
NEW YORK—Continued.	
New York City—Continued:	
American Society of Civil Engineers	4
Astor Library	50
Columbia College	9
Cooper Union	1
Engineering and Mining Journal	14
Historical Society	4
Insurance Department	1
Lenox Library	5
Manufacturer and Builder	9
Medical Society	1
Mercantile Library Association	2
Meteorological Observatory	3
Metropolitan Museum of Art	19
Museum of Natural History	16
New York Academy of Medicine	3
New York Medical Journal	1
New York Statistical Society	1
New York Times	1
Numismatic and Archæological Society	6
Prison Association	2
Public School Society	1
Sanitarian	13
Scientific American	1
School of Mines	12
Society of Civil Engineers	7
University of New York	4
United States Sanitary Commission	3
Poughkeepsie:	
Vassar Female College	3
Syracuse:	
University	2
Troy:	
Rensselaer Polytechnic Institute	3
West Point:	
United States Military Academy	3
NORTH CAROLINA.	
Raleigh:	
State Library	1
OHIO.	
Ashtabula:	
Anthropological Society	1
Cincinnati:	
American Medical College	1
Historical and Philosophical Society	1
Mercantile Library	1
Observatory	39
Public Library	3
Society of Natural History	11
Zoological Society	1
Cleveland:	
Academy of Natural Sciences	9
Kirtland Society	5
Observatory	1
Columbus:	
Geological Survey of Ohio	5
Horticultural Society	1
State Agricultural Society	22
State Board of Agriculture	26
State Library	5
Delaware:	
Ohio, Wesleyan University	2
Gambier:	
Kenyon College	1
PENNSYLVANIA.	
Allegheny:	
Observatory	7
Society of Natural Sciences of West Pennsylvania	1
Bethlehem:	
Packer University	6
Carlisle:	
Carlisle Society of Literature	1
Easton:	
Institute of Mining Engineers	8
Germantown:	
Germantown Literary Association	1

	1879.
PENNSYLVANIA—Continued.	
Harrisburg:	
Second Geological Survey of Pennsylvania	7
State Agricultural Society	1
State Library	2
Lewisburg:	
University	1
Media:	
Delaware County Institute of Science	14
Philadelphia:	
Academy of Natural Sciences	276
American Entomological Society	56
American Journal of Conchology	3
American Naturalist	12
American Philosophical Society	187
Board of Public Charities	1
Board of Trade	2
Board of Public Education	3
Central High School	4
Franklin Institute	23
Franklin Journal	9
Historical Society	17
Horticultural Society	1
Library Company	24
Library of Pennsylvania Hospital	1
Medical and Chirurgical Journal	8
Medical Society	1
Medical Times	12
Numismatic and Archæological Society	5
Observatory of Girard College	1
Pharmaceutical Society	28
Royal Bavarian Consulate	1
Society for Alleviating the Miseries of Public Prisons	1
University of Pennsylvania	2
United States Mint	1
Wagner Free Institute	9
Zoological Society	25
RHODE ISLAND.	
Newport:	
Society of Science	1
Providence:	
American Naturalist	12
Brown University	9
Rhode Island Historical Society	4
SOUTH CAROLINA.	
Charleston:	
Charleston Medical Journal and Review	1
Charleston Museum of Natural History	1
College of Charleston	1
Elliot Society of Natural History	16
Library Society	2
South Carolina College Library	1
South Carolina Historical Society	2
South Carolina Medical Association	2
Columbia:	
State Library	1
TENNESSEE.	
Knoxville:	
Tennessee Philomatesian Society	1
Lebanon:	
Cumberland University	1
Nashville:	
Historical Society of Tennessee	1
State Library	2
TEXAS.	
Chapel Hill:	
Soulé University	2
VERMONT.	
Burlington:	
University of Vermont	1
Castleton:	
Orleans County Society of Natural Sciences	50
Montpelier:	
State Library	2

	1879.
VIRGINIA.	
Charlottesville:	
University of Virginia	10
Hampton:	
Hampton Normal Institute	1
Lexington:	
School of Civil Engineers	1
New Market:	
Polytechnic Institute	1
Richmond:	
State Library	3
WISCONSIN.	
Beloit:	
Geological Survey of Wisconsin	2
Galesville:	
Galesville University	1
Inmanville:	
Scandinavian Society	4
Madison:	
Academy of Sciences	83
College of Arts, University of Wisconsin	1
Historical Society	7
State Agricultural Society	44
State Library	1
University of Wisconsin	2
Milwaukee:	
Naturhistorischer Verein	18
Neenah:	
Wisconsin Scandinavian Library	4
BRITISH AMERICA.	
Duhut, Canada:	
Scandinavian City Library	1
Fredericton, New Brunswick:	
Legislative Library	1
Library of Kings College	1
University of New Brunswick	1
Guelph, Canada:	
Ontario School of Agriculture	1
Halifax, Nova Scotia:	
Department of Mines	1
Nova Scotian Institute of Natural Sciences	10
Hamilton, Canada:	
Scientific Association	4
Kingston, Canada:	
Queen's College Observatory	1
Montreal, Canada:	
Canadian Naturalist	3
Entomological Society of Canada	1
Geological Survey of Canada	20
Historical Society	3
Legislative Library	1
L'Union Médicale de Canada	1
McGill College	3
Medical Association of Canada	2
Medical Record	1
Medical and Surgical Journal	1
Natural History Society	18
Numismatic and Antiquarian Society	1
Observatory	2
Société d'Agriculture du Bas, Canada	1
Ottawa, Canada:	
Department of Agriculture	1
Library of the House of Commons	1
Library of Parliament	3
Literary and Scientific Society	3
Surveyor-General	1
Quebec, Canada:	
Bibliothèque de la Province de Quebec	1
Geographical Society	2
Historical Society	1
History and Natural History Society	1
Laval University	2
Literary and Historical Society	14
Literary and Horticultural Society	1
Literary and Philosophical Society	1
Naturaliste Canadien	9
Observatory	1

	1879.
BRITISH AMERICA—Continued.	
Toronto, Canada:	
Canadian Entomologist	1
Canadian Institute	47
Canadian Journal	2
Canadian Journal of Medical Science	1
Canadian Lancet	1
Department of Marine and Fisheries	1
Entomological Society	1
Fruit Growers' Association	1
House of Assembly	1
Literary and Historical Society	1
Magnetic Observatory	1
Meteorological Office	2
Observatory	3
Trinity College	1
University	2
University College	2
Saint John, New Brunswick:	
Library of the Mechahics' Institute	1
Saint John's, Newfoundland:	
Geological Survey of Newfoundland	1
Total number of addresses	444
Total number of packages	5, 786
INDIVIDUALS.	
Abbe, Prof. C	9
Abbot, Colonel	1
Abbott, Dr. C. C	1
Adams, Charles F	1
Agassiz, Prof. A	15
Alberdurgh, F. C. Th	1
Allen, J. A	1
Andrews, R. R	1
Atkins, Mr	1
Bailey, H. B	1
Baird, S. F	25
Bancroft, Hon. George	1
Bansett, P	1
Barlow, Hon. F. C	1
Barnard, President F. A. P	1
Barnard, Gen. J. G	1
Barnard, I. M	1
Barnes, Hon. W	4
Barnes, Professor	1
Bassett, H. F	1
Baxter, Mr	1
Baxter, Col. J. H	1
Beecher, Rev. Charles	1
Bell, Robert	2
Bellows, Rev. H. W	1
Berkmans, Mr	2
Berton, M	1
Bessels, Dr. E	21
Billings, Dr. J. S	2
Binney, W. G	8
Blake, Prof. W. P	1
Bland, Thomas	3
Blandy, John F	1
Blasius, Professor	2
Bleasdale, Rev. Cannon	1
Boardman, S. L	1
Boehmer, George H	1
Botta, Vinzence	2
Brachvogel, Udo	1
Brendel, Dr. F	1
Brewer, Dr. T. M	1
Broadhead, G. C	5
Brooks, W. K	1
Broughton, Fred	1
Brown, John C	1
Brush, Prof. George J	2
Burgess, Edward	1
Burnett, Dr. S. M	1
Canby, W. M	1
Carpwall, Mr	1
Casamap, P	1
Cerpmad, C	1
Chamberlin, C. W	1
Chamberlin, T. C	2
Chandler, Capt. R	1
Chandler, Professor C. F	3

	1879.
INDIVIDUALS—Continued.	
Clarke, Prof. S. F	1
Clarkson, M	1
Claypole, E. W	1
Clement, M	1
Clinton, George W	3
Coffin, Prof. J. H. C	2
Conn, Dr. G. P	1
Cook, Prof. G. H	2
Cope, Prof. E. D	11
Coues, Dr. E	29
Cox, Prof. E. T	5
Cresson, E. T	1
Crosier, Dr. E. S	1
Dall, W. H	26
Daly, Chief Justice	1
Dana, Prof. J. D	38
Daniells, Prof. W. W	1
Davis, Admiral	1
Dawson, G. M	5
Dawson, J. W	2
Dean, J. W	1
Deane, Dr. R	1
Delefontaine, Prof. Dr	1
Delfosse, Hon. M	1
Denham, Ed	1
Dinwiddie, Robert	1
Dod, A. F	1
Domville, Hon. J	1
Dow, Capt. J. W	5
Downes, John	1
Draper, Prof. D	2
Draper, Prof. Henry	2
Eastman, Professor	1
Eaton, Dr. D. C	1
Edison, T. A	1
Edwards, W. H	3
Ellis, F. B	1
Elsberg, Dr. L	1
Emerson, Prof. B	4
Emerson, Ben. K	1
Emmons, S. F	1
Emory, Gen. W. H	1
Endeman, Dr. H	1
Engelman, Dr. George	3
Ericson, Capt. John	1
Farlow, Prof. W. G	4
Ferrell, Prof. W	2
Firth, A	1
Fisher, Dr. G. I	1
Foerster, Doctor	1
Fortin, Hon. P	1
Frémont, General	3
Franklin, Capt. S. P	1
Gabb, W. M	1
Garman, Doctor	1
Gatschet, Albert S	1
Genth, F. A	1
Gerard, Doctor	1
Gibbs, Mr	1
Gilbert, G. K	1
Gill, Prof. T. N	3
Gilpin, Governor	2
Glover, Townsend	1
Goode, Prof. G. Brown	14
Goottfellow, Ed	1
Gray, Prof. Asa	19
Gray, O. W., & Son	1
Greene, Lieut. F	2
Griswold, S. B	1
Gross, Dr. S. D	1
Guttenberg, G	1
Guyot, Prof. A	11
Hagen, Prof. A. H	12
Hall, Prof. A	2
Hall, Prof. James	14
Hammond, I. L	1
Harkness, Professor	2
Harper Brothers	1
Harrington, W	1
Harrison, W. G	1
Hawkins, C. Rush	1
Hayden, Dr. F. V	138

	1879.
INDIVIDUALS—Continued.	
Hilgard, Prof. J. E	3
Hill, G. W	2
Hillebrand, E	1
Hind, Prof. W. Y	1
Hinde, Prof. G. J	1
Hinrichs, Prof. G	18
Hitchcock, Professor	2
Hitz, Hon. John	1
Hjort, Rev. O. J	1
Holden, Prof. E. S	4
Holmes, Nath	1
Horn, G	1
Horn, J	1
Hough, F. B	1
Houghton, Osgood & Co	2
Howe, T. O	1
Hübne, Julian	1
Huart, Abbe	1
Huart, Victor	4
Humphreys, General A. A	2
Hunt, Dr. Ch. O	1
Hunt, Dr. Sterry	5
Jackson, M	2
Jarvis, Dr E	37
Johnson, Prof. J. L	1
Jones, C. C	1
Jones, Dr. J. Matthew	1
Jordan, Prof., Dr	1
Kapp, William	1
Kelley, Norman C	1
Kerr, W. C	2
Kimball, J. P	1
King, Prof. Clarence	27
Kingston, Prof. J. T	3
Kirchloff, Theodore	3
Krohn, Rev. J	1
Langley, Professor	1
Lawrence, George N	4
Lea, Dr. Isaac	12
Le Conte, Doctor	14
Lee, Dr. William	4
Leidy, Dr. Joseph	14
Lesley, Professor	4
Lesquereux, Leo	3
Lecuh, E	1
Lindau, Prof. Leopold	2
Lockington, W. N	1
Loomis, Prof. E	9
Lyman, Prof. B. S	6
McCosh, President	2
Mallett, J. W	3
Manigault, Prof. G. E	3
Marsh, Prof. O. C	13
Martin, Prof. H. N	1
Marx, Maj. G	1
Mason, Prof. O. T	2
Matile, G. A	1
Matthew, G. F	1
Meigs, Dr. J. Aitken	2
Meyer, Abraham	1
Miller, S. A	3
Mitchell, H	1
Myer, General A. J	3
Name, A. von	2
Newberry, Dr. J. S	13
Newcomb, Prof. S	6
Newton, H	1
Newton, Prof. H. A	4
Nipher, F. E	4
Nolan, E. J	1
Nordhoff, Ch	1
Norton, S. A	1
Nourse, Prof. J. E	3
Olmstead, Dr. L. G	1
Olmstead, Rev. L. E	1
Ostendörfer, O	1
Otis, Doctor	1
Ottesen, Rev. J. A	1
Packard, Doctor	1
Packard, jr., Prof. A. S	12
Parker & Douglas	2
Patterson, Captain	1

	1879.
INDIVIDUALS—Continued.	
Peale, Dr. A. C	1
Peale, T. R	1
Pearson, Jonathan	8
Peck, Ch. H	1
Peet, Rev. Stephen D	1
Peirce, Prof. B	3
Peters, Prof. C. H. F	3
Philbrick, John D	1
Pickering, Professor	1
Pinkham, Prof. G. L	1
Poole, Dr. H	1
Porter, Rev. Noah	1
Pourtales, Count	2
Powell, Prof. J. W	8
Praetorius, Doctor	1
Preuss, Rev. H. A	1
Prime, Temple	1
Pumpelly, Raph	1
Putnam, F. W	2
Rau, Prof. Charles	4
Redfield, John H	1
Redfield, Professor	1
Rice, Dr. John A	1
Richardson, jr	6
Ridgway, Robert	8
Riley, Prof. C. V	2
Roessler, A. R	1
Roessler, F. E	1
Rogers, Professor	3
Rogers, Prof. H. B	3
Ross, Prof. A. M	1
Rutherfurd, L. M	1
Rust, Th. N	1
Safford, Prof. I. H	2
Safford, Prof. W. H	1
Salisbury, E. E	1
Salisbury, Dr. J. H	2
Salisbury, Stephen	1
Sanford, John E	5
Sargent, Professor	1
Scudder, Dr. S. H	6
Schott, Charles A	1
Schumacher, Dr. H. A	1
Schurz, Hon. Carl	2
Schuster, M	3
Selwyn, A. R. C	7
Seyffarth, Dr. G	1
Shepard, Prof. Ch. U	1
Shepherd, Prof. H. E	1
Silliman, Professor	7
Simon, Prof. Dr. W	1
Smallwood, Doctor	1
Smith, Dr. Sidney J	2
Smith, Dr. W. M	1
Smith, E. A	1
Smith, Prof. H. L	1
Smith, Prof. J. Lawrence	3
Snow, Dr. E	5
Snow, Prof. F. H	1
Sparks, J	1
Spofford, A. R	3
Squier, E. G	2
St. John, Prof. O	2
Stevenson, Captain	1
Stevenson, William C	1
Stone, Rev. E. M	1
Stone, O	2
Stidham, Rev. J. F	1
Stoecker, H	2
Storer, Professor	1
Sylvester, Professor	3
Thomas, Prof. C	1
Thomson, John H	9
Thurber, Geo	1
Thurston, R. H	1
Tryon, George W	3
Tuckermann, Professor	8
Turner, Doctor T. G	2
Twining, Prof. H	4
Uhler, Prof. P. R	2
Verrill, Prof. A. E	3
Wagner, Prof. W	1

	1879.
INDIVIDUALS—Continued.	
Waldo, Leonard	1
Walker, Prof. F. A	4
Ward, James W	1
Ward, Professor	1
Ward, Townsend	1
Warder, Dr. A	4
Watson, J. C	1
Watson, Professor	1
Watson, Prof. Sereno	1
Wells, M. D	1
Wheatly, Ch. M	2
Wheeler, Capt. George M	17
Whipple, George M	1
White, Dr. C. A	8
White, Dr. C. E	1
White, Dr. E. A	1
Whiteaves, J. F	3
Whitney, Prof. J. D	8
Whitney, Prof. W. D	7
Willey, Henry	1
Williams, Rev. S. Wells	1
Wilson, Dr. Daniel	2
Winchell, N. H	7
Winthrop, C	1
Winthrop, R. S	1
Witcher, F. W	1
Woodward, Dr. J. J	2
Woodworth, Doctor	1
Worthen, Dr. A. H	4
Wyman, Colonel	1
Wyman, Commodore	4
Yarnall, Professor	1
Yarrow, Doctor	5
Yates, Dr. L. G	1
Youmans, Dr. E. L	2
Young, Prof. C. A	14
Young, C. B	8
Zaremba, Dr. C. W	1
Zehran, M	1
Total of individuals	341
Total of packages	1, 185

RECAPITULATION.

	No. of addresses.			No. of packages.		
	1877.	1878.	1879.	1877.	1878.	1879.
Societies	392	292	444	3, 868	4, 059	5, 786
Individuals	374	370	341	1, 094	1, 233	1, 185
Total	766	662	785	4, 962	5, 292	6, 971

ACTS AND RESOLUTIONS OF CONGRESS RELATIVE TO THE SMITHSONIAN INSTITUTION, AND THE NATIONAL MUSEUM.

FORTY-FIFTH CONGRESS, THIRD SESSION, 1878-'79.

AN ACT to aid in the protection of the public buildings and property against loss and damage by fire.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a commission composed of the Commissioner of Patents, the Supervising Architect of the Treasury Department, and the Secretary of the Smithsonian Institution is hereby constituted and authorized to examine such automatic signal telegraph systems as may be submitted to them by the owners and agents thereof and to ascertain which of the same is best adapted for the purpose of the earliest and most certain transmission by signal of the occurrence of fire, and also the adaptability, usefulness, and need of the same for the further protection of the buildings and property of the government in the several departments in Washington, and to report the results of their examination to the next session of Congress.

Approved, December 13, 1878.

(Statutes of the United States, Forty-fifth Congress, third session, chapter 4, page 257.)

AN ACT authorizing the Chancellor of the Smithsonian Institution to appoint an Acting Secretary in certain cases.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in the case of the death, resignation, sickness, or absence of the Secretary of the Smithsonian Institution, the Chancellor thereof shall be, and he is hereby, authorized to appoint some person as Acting Secretary, who for the time being shall be clothed with all the powers and duties which by law are devolved upon the Secretary, and he shall hold said position until an election of Secretary shall be duly made, or until the Secretary shall be restored to his health, or, if absent, shall return and enter upon the duties of his office.

Approved, January 24, 1879.

(Statutes of the United States, Forty-fifth Congress, third session, chapter 21, page 264.

AN ACT making appropriations for the service of the Post Office Department for the fiscal year ending June thirtieth, eighteen hundred and eighty, and for other purposes.

SEC. 20. That mailable matter of the fourth class shall embrace all matter not embraced in the first, second, or third class which is not in its form or nature liable to destroy, deface, or otherwise damage the contents of the mail-bag, or harm the person of any one engaged in the postal service, and is not above the weight provided by law, which is hereby declared to be not exceeding four pounds for each package thereof, except in case of single books weighing in excess of that amount, and except for books and documents published or circulated by order of Congress, or official matter emanating from any of the departments of the government or from the Smithsonian Institution, or which is not declared non-mailable under the provision of section thirty-eight hundred and ninety-three of the Revised Statutes as amended by the act of July twelfth, eighteen hundred and seventy-six, or matter appertaining to lotteries, gift concerts, or fraudulent schemes or devices.

(Statutes of the United States, Forty-fifth Congress, third session, chapter 180, page 360.)

AN ACT making appropriations for sundry civil expenses of the government for the fiscal year ending June thirtieth, eighteen hundred and eighty, and for other purposes.

* * * And all collections of rocks, minerals, soils, fossils, and objects of natural history, archæology, and ethnology, made by the Coast and Interior Survey, the Geological Survey, or by any other parties for the Government of the United States when no longer needed for investigations in progress shall be deposited in the National Museum.

(Statutes of the United States, Forty-fifth Congress, third session, chapter 182, page 394.)

FORTY-SIXTH CONGRESS, SECOND SESSION, 1879–'80.

JOINT RESOLUTION filling existing vacancies in the Board of Regents of the Smithsonian Institution.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the existing vacancies in the Board of Regents of the Smithsonian Institution of the class other than members of Congress, shall be filled by the reappointment of Asa Gray, of Massachusetts, Henry Coppée, of Pennsylvania, John Maclean, of New Jersey, and Peter Parker, of the city of Washington, whose terms have expired. (Public Resolution No. 2. Statutes of the United States, Forty-sixth Congress, second session, p. 299.)

Approved, December 19, 1879.

AN ACT for the erection of a bronze statue of Joseph Henry, late Secretary of the Smithsonian Institution.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Regents of the Smithsonian Institution be, and are hereby authorized to contract with W. W. Story, sculptor, for a statue in bronze of Joseph Henry, late Secretary of the Smithsonian Institution, to be erected upon the grounds of said Institution; and for this purpose, and for the entire expense of the foundation and pedestal of the monument, the sum of fifteen thousand dollars is hereby appropriated, out of any moneys in the Treasury not otherwise appropriated.

Approved, June 1, 1880.

(Statutes of the United States, Forty-sixth Congress, second session, chapter 116, page 154.)

REPORT OF THE EXECUTIVE COMMITTEE OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION, FOR THE YEAR 1879.

The Executive Committee of the Board of Regents of the Smithsonian Institution respectfully submit the following report in relation to the funds of the Institution, the appropriations by Congress for the National Museum, the receipts and expenditures for both the Institution and the Museum for 1879, and the estimates for the year 1880.

CONDITION OF THE FUNDS, JANUARY, 1880.

The amount originally received as the bequest of James Smithson, of England, deposited in the Treasury of the United States, in accordance with the act of Congress of August 10, 1846	$515,169 00	
Residuary legacy of Smithson, received in 1865, deposited in the Treasury of the United States, in accordance with the act of Congress of February 8, 1867	26,210 63	
		$541,379 63
Additional amount deposited in the Treasury of the United States, derived from savings, &c., authorized by act of Congress, February 8, 1867	108,620 37	
Amount received as the bequest of James Hamilton, of Carlisle, Pa., February 24, 1874	1,000 00	
		109,620 37
Total permanent Smithson fund in the Treasury of the United States, bearing interest at 6 per cent., payable semi-annually		651,000 00
In addition to the above, there is invested in Virginia Bonds and certificates, $88,125.20, valued January 1880, at		32,000 00
Also the cash balance in the United States Treasurer's hands, January 2, 1880		20,894 06
Total Smithson funds, January 2, 1880		$703,894 06

Virginia stock.—The Institution owns the following bonds and certificates of the State of Virginia:

Consolidated bonds:		
58 bonds, Nos. 11521 to 11578 inclusive, for $1,000 each	$58,000 00	
1 bond, No. 1380, for	500 00	
2 bonds, Nos. 4191 and 4192, for $100 each	200 00	
Deposited with the Treasurer of the United States		$58,700 00
Deferred certificates:		
No. 4543, dated July 1, 1871, for	$29,375 07	
No. 2969, dated July 1, 1871, for	50 13	
Deposited with Riggs & Co		29,425 20
Total of Virginia securities		88,125 20
The estimate by Riggs & Co. of the value of these bonds and certificates, January 1, 1880, is		32,000 00

The coupons on the consolidated bonds for January 1 and July 1, 1879, were sold for the Institution, November 12, 1879, as follows:

$3,480 Virginia, $30 coupons, at 83	$2,888 40	
30 Virginia, $15 coupons, at 90¼	27 08	
12 Virginia, $3 coupons, at 92	11 04	
3,522	2,926 52	
Less commission on $3,522, at ½ of one per cent	17 60	
Net proceeds of coupons		$2,908 92

Hamilton bequest.—James Hamilton, of Carlisle, Pa., bequeathed to the Smithsonian Institution (February 24, 1874)	$1,000 00

This amount is deposited in the Treasury of the United States as an addition to the Smithson Fund, in accordance with the Act of Congress of February 8, 1867.

Interest received for the year 1879	$60 00

RECEIPTS IN 1879.

Interest on $650,000 for the year 1879, at 6 per cent	$39,000 00
Interest on Virginia bonds:	
Sale of coupons, by Riggs & Co., for January 1 and July 1, 1879, for $3,522 (November 12, 1879), at 83, 90¼, 92, less commission	2,908 92
Interest on Hamilton fund of $1,000 for the year 1879	60 00
Legacy of Simeon Habel, of New York	402 59
Balance on hand at the beginning of 1879	19,632 57
Total receipts for the year 1879	$62,004 08

EXPENDITURES IN 1879.

Building:		
Repairs and improvements	$2,232 28	
Furniture and fixtures (for new offices, &c.)	1,110 25	
		$3,342 53
General expenses:		
Meetings of the Board	580 80	
Lighting the building	74 50	
Heating the building	234 96	
Postage and telegrams	215 38	
Stationery	982 83	
Incidentals, insurance, ice, hauling	918 94	
Salaries	13,150 00	
Extra clerk hire and labor	159 65	
Books and periodicals	567 13	
		16,884 19
Publications and researches:		
Smithsonian Contributions to Knowledge	3,129 49	
Smithsonian Miscellaneous Collections	6,170 24	
Smithsonian annual report	97 86	
Researches	975 85	
Apparatus	14 85	
Laboratory	206 84	
Explorations	683 70	
		11,278 83
Exchanges:		
Literary and scientific exchanges		9,554 47
Gallery of Art:		
Purchase of busts		50 00
Total expenditures in 1879		$41,110 02
Balance in Treasury of United States January 2, 1880		$20,894 06

Among the receipts for the year is a bequest of $402.59 by Dr. Simeon Habel, of New York, the author of one of the Smithsonian Contributions to Knowledge, published in 1878, entitled "The Sculptures of Santa Lucia Cosumalwhuapa in Guatemala." The author was an Austrian physician who relinquished his medical practice to make at his own expense a tour of exploration through Central America. The results of his researches were presented to the Smithsonian Institution for publication. Professor Henry afforded every facility to Dr. Habel for the preparation of his work, by furnishing him a room for several months at the Institution where he could have his drawings copied by a skillful artist, and the doctor in appreciation of this courtesy informed the Secretary that on his death he would leave a part of his property to the Smithsonian Institution.

Notice of his death on the 1st of January, 1879, at New York, having been received, steps were taken to secure the promised legacy, and the sum actually received from the Emigrant Savings Bank of New York, in accordance with Dr. Habel's instructions, was $402.59. To this sum it is proposed that $97.41 should be added, so that the amount of $500 may be deposited in the Treasury of the United States as a part of the permanent fund.

Repayments.—The Institution has made temporary advances during the year for freight, &c., the repayment of which, with the amount received from sales of the publications of the Institution, &c., have been deducted from the expenditures for the year.

These repayments are as follows:

To exchanges	$919 69
To building	1,302 58
To furniture	41 00
To stationery	16 50
To Smithsonian publications	242 07
To incidentals	12 81
To postage	9 46
Total repayments in 1879	$2,544 11

ESTIMATES FOR 1880.

The following are the estimates of receipts by the Institution for the year 1880, and the appropriations required for carrying on its operations during the same period.

Estimated receipts.

Interest on the permanent fund, receivable July 1, 1880, and January 1, 1881	$39,000 00	
Interest on the Hamilton fund for 1880	60 00	
Sale of Virginia coupons, due January 1 and July 1, 1880	2,800 00	
		$41,860 00

Proposed appropriations.

For building	$2,000 00	
For general expenses	14,000 00	
For publications and researches	14,000 00	
For exchanges	10,000 00	
For books and apparatus	1,000 00	
For contingencies	860 00	
		41,860 00

NATIONAL MUSEUM.

The following appropriations were made by Congress in 1879 for disbursal under the direction of the Smithsonian Institution:

Preservation of collections, Smithsonian Institution: For preservation and care of the collections of the National Museum, including those from the International Exhibition of 1876. (Forty-fifth Congress, third session, chapter 182; 1879, March 3)	$23,000
Distribution of duplicates: For expenses of making up into sets, for distribution to colleges and museums, the duplicate ores, minerals, and objects of natural history belonging to the United States. (Forty-fifth Congress, third session, chapter 182; 1879, March 3)	5,000
Preservation of collections, Smithsonian Institution, Armory Building: For expense of watching and storage of articles belonging to the United States, including those transferred from the International Exhibition of 1876. (Forty-fifth Congress, third session, chapter 182; 1879, March 3)	2,500
Additional security against fire: For providing additional security against fire in the Smithsonian building for the government collections, in accordance with report of the commission appointed to examine the public buildings, December 10, 1877. (Forty-fifth Congress, third session, chapter 182; 1879, March 3)	3,000
For completing and preparing for publication the contributions to North American Ethnology, under the Smithsonian Institution: *Provided*, That all the archives, records, and materials relating to the Indians of North America, collected by the geographical and geological survey of the Rocky Mountain Region, shall be turned over to the Smithsonian Institution, that the work may be completed and prepared for publication under its direction: *Provided*, That it shall meet the approval of the Secretary of the Interior and of the Secretary of the Smithsonian Institution. (Forty-fifth Congress, third session, chapter 182, 1879; March 3)	20,000
For a fire-proof building, for the use of the National Museum, three hundred feet square, to be erected under the direction and supervision of the Regents of the Smithsonian Institution, in accordance with the plans now on file with the Joint Committee of Public Buildings and Grounds, on the southeastern portion of the grounds of the Smithsonian Institution, said building to be placed east of the Smithsonian Institution, leaving a roadway between it and the latter of not less than fifty feet, with its north front on a line with the south face of the buildings of the Agricultural Department and of the Smithsonian Institution, and all expenditures for	

the purposes herein mentioned, not including anything for architectural plans, shall be audited by the proper officers of the Treasury Department. (Forty-fifth Congress, third session, chapter 182; 1879, March 3)*	$250,000
Smithsonian Institution: For the preservation of the specimens of the United States surveying and exploring expeditions 1879. (Forty-fifth Congress, third session, chapter 183, page 417; March 3, 1879)	4,000

The following is a statement of the receipts, expenditures, and balances of the National Museum accounts:

PRESERVATION OF COLLECTIONS AND DISTRIBUTION OF DUPLICATES.

Receipts.

1879.			
January 1.	Balance unexpended of appropriation for year ending June 30, 1879	$11,389 30	
	Appropriation for deficiencies, 1879	4,000 00	
July 1.	Appropriation for the year ending June 30, 1880	28,000 00	
	Cash refunded for coal and freight	290 76	
			$43,680 06

Expenditures.

For the quarter ending March 31, 1879	$6,818 41	
For the quarter ending June 30, 1879	8,626 69	
For the quarter ending September 30, 1879	9,900 40	
For the quarter ending December 31, 1879	6,842 37	
		32,187 87
Balance available from January 1 to July 1, 1880		11,492 19

FOR ARMORY BUILDING.

Receipts.

1879.			
Jan. 1.	Balance unexpended of appropriation for the year ending June 30, 1879	$1,171 24	
July 1.	Appropriation for year ending June 30, 1880	2,500 00	
			3,671 24

Expenditures.

For the quarter ending March 31, 1879	928 27	
For the quarter ending June 30, 1879	128 38	
For the quarter ending September 30, 1879	606 33	
For the quarter ending December 31, 1879	970 72	
		2,633 70
Balance available from January 1 to July 1, 1880		$1,037 54

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* For a full account of the construction of this building see the report of the National Museum Building Commission.

FOR ADDITIONAL SECURITY AGAINST FIRE.

Receipts.

1879.		
July 1.	Appropriation for year ending June 30, 1880	$3,000 00

Expenditures.

For the quarter ending September 30, 1879....	$461 95	
For the quarter ending December 31, 1879.....	1,230 63	
		1,692 58
Balance available from January 1 to July 1, 1880...		1,307 42

FOR COMPLETING CONTRIBUTIONS TO ETHNOLOGY.

Receipts.

1879.		
July 1.	Appropriation for the year ending June 30, 1880.	$20,000 00

Expenditures.

For the two quarters ending December 31, 1879.........	13,769 00
Balance available from January 1 to July 1, 1880	6,231 00

FOR FIRE-PROOF BUILDING FOR THE NATIONAL MUSEUM.

Receipts.

1879.		
March 3.	Appropriation for new building...............	$250,000 00
	Expenditures to Jan. 1, 1880.................	143,146 38
	Balance available from January 1 to July 1, 1880.	$106,853 62

SUMMARY.

The Executive Committee have examined 687 vouchers for payments made from the Smithson income during the year 1879, and 690 vouchers for payments made from appropriations by Congress for the National Museum, making a total of 1,377 vouchers. All these bear the approval of the Secretary of the Institution, and a certificate that the materials and services charged were applied to the purposes of the Institution.

The committee have examined the account books of the National Museum and find the balances as before stated—preservation, $11,492.19; armory, $1,037.54; security against fire, $1,307.42—to correspond with the certificates of the disbursing clerk of the Department of the Interior. They also find the balance of $106,853.62 of the National Museum building appropriation corresponds with the certificate of the disbursing officer of the Treasury Department January 5, 1880.

The quarterly accounts current, bank-book, check-book, and journal of the Institution have been examined and found to be correct, and show a balance to the credit of the Institution on the 2d of January, 1880, in the hands of the Treasurer of the United States of $20,894.06 available for the current operations of the Institution.

Respectfully submitted.

PETER PARKER,
W. T. SHERMAN,
Executive Committee Smithsonian Institution.

WASHINGTON, *January* 19, 1880.

NATIONAL MUSEUM BUILDING COMMISSION,
OFFICE OF SMITHSONIAN INSTITUTION,
Washington, D. C., January 19, 1880.

To the Board of Regents of the Smithsonian Institution:

GENTLEMEN: For several years past the attention of the Board of Regents has been called to the rapid growth of the collections in the National Museum and the need of increased accommodations for the same. This necessity, however, was not deemed sufficiently imperative to authorize a request for special Congressional legislation until the close of the Centennial Exhibition, when it became evident that the articles gathered by the Smithsonian Institution for the exhibition in Philadelphia, under the act of Congress, added to the numerous centennial exhibits presented to the United States and taken charge of by the Smithsonian Institution, constituted a mass of material for which no provision could possibly be made in the present Smithsonian building. Under these circumstances, the Board of Regents on the, 5th of February, 1877, memorialized Congress for an appropriation of $250,000 for the "immediate erection of a spacious building," and a few weeks subsequently a bill for the purpose passed the Senate, but too late in the session to secure consideration in the House of Representatives. The effort was renewed during the winter of 1877–'78, but likewise without action. On the 3d of March, 1879, however, the desired appropriation was made through a provision in the sundry civil bill, as follows:

"For a fire-proof building for the use of the National Museum, 300 feet square, to be erected under the direction of the Regents of the Smithsonian Institution, in accordance with the plans now on file with the Joint Committee of Public Buildings and Grounds, on the southeastern portion of the grounds of the Smithsonian Institution, two hundred and fifty thousand dollars: Said building to be placed east of the Smithsonian Institution, leaving a roadway between it and the latter of not less than fifty feet, with the north front on a line with the south face of the buildings of the Agricultural Department and of the Smithsonian Institution; and all expenditures for the purposes herein mentioned, not including anything for architectural plans, shall be audited by the proper officers of the Treasury Department."

Anticipating the early action of Congress in the premises, the Board of Regents, on the 17th of January, 1879, adopted the following resolution:

"*Resolved*, That the Executive Committee of the Board, or a majority thereof, and the Secretary be, and they are hereby, authorized and empowered to act for and in the name of the Board of Regents in carrying into effect the provisions of any act of Congress that may be passed providing for the erection of a building for the National Museum."

Accordingly, on the 7th of March, 1879, Hon. Peter Parker and General W. T. Sherman, the resident members of the executive committee, with the Secretary, met in the office of the Institution, and after organizing under the title of "National Museum Building Commission," of which General W. T. Sherman was chosen chairman, proceeded to adopt such measures as in their opinion appeared best calculated to realize, with the least possible delay, the intention of Congress.

The committee at the outset invited General M. C. Meigs, Quartermaster-General U. S. A., to act in the capacity of consulting engineer to the commission, and also selected Messrs. Cluss and Schulze, whose plans for the new building were those approved by Congress, as superintending architects. Mr. Daniel Leech was appointed secretary of the commission.

To remove as far as possible any doubt as to the sufficiency of the appropriation for a building in accordance with the plans approved by Congress, Mr. Edward Clark, Architect of the Capitol, and General Meigs, after carefully considering the provisional estimates of the architects, informed the commission that in their opinion the amount was sufficient for the purpose.

To obtain a clear understanding of the intent of Congress in making the appropriation, as well as to ascertain how far, if desirable, the commission might be authorized to depart from the plans before the Committees of Public Buildings and Grounds when the act was passed, the chairmen of the respective committees (Hon. H. L. Dawes and Hon. Philip Cook) were consulted; whereupon these gentlemen officially informed the commission "that, provided the general design be retained, it was not their intention, nor that of their committees, to confine the Board of Regents of the Smithsonian Institution to the minor details of the aforesaid plans, but to authorize any modifications that might appear to them desirable in the interest of economy or for the better adaptation of the building to its object."

On ascertaining that the appropriation could be made immediately available under the clause directing that the account should be audited by the proper officers of the Treasury Department, the Secretary of the Treasury was, on the 27th of March, requested to designate some one of his force to act as disbursing officer. Accordingly Maj. T. J. Hobbs, disbursing clerk of the department, was selected, and payments were authorized to be made by him on vouchers approved by the Secretary of the Smithsonian Institution as provided for in the following resolution:

"*Resolved*, That the commission appointed by the Board of Regents of the Smithsonian Institution to superintend the construction of a new fire-proof building for the National Museum hereby authorize Prof. S. F. Baird, Secretary of the Institution, to act as their agent to approve for payment by Thomas J. Hobbs, all bills for services and supplies from such funds as are placed in the hands of the latter by said commisssion for such purposes, and the Secretary of the Treasury is hereby respectfully requested to instruct Thomas J. Hobbs, disbursing agent, to pay any bills when thus certified and found to be otherwise technically correct."

Having thus prepared the way to a commencement of active operations, specifications were at once prepared and proposals invited for carrying on the work. Ground was broken on the 17th of April, 1879.

The concrete foundations were begun on the 29th of April, and the brick-work of the walls on the 21st of May, the main walls being completed on the 1st day of November.

In consequence of the low prices of the more important building materials, very favorable contracts were made, especially for the brick required and for the iron-work, since the price of iron advanced very materially within a few months from the date referred to. The same is true with regard to glass, bricks, and, in fact, almost all building materials.

For details of construction, as well as for a statement of expenditures to date, the board is referred to the appended report of the superintending architects.

The estimate of $250,000 for the construction of a museum building did not include the heating apparatus. As the work progressed, however, it became evident that all the underground piping for water, gas, and steam, at least, could be obtained from the fund.

In anticipation of an appropriation for the purpose, it was deemed best to obtain provisional bids for a steam-heating apparatus. Accordingly proposals were invited: first, for the underground pipes; second, for the boilers; third, for the radiators. The aggregate of the estimates for the three items varied from $13,940 to $55,680.

The lowest bid was rejected on account of inadequacy of the supply of heat. The next to the lowest was that of Messrs. Baker, Smith & Co., for $19,768, which was accepted, and a contract made for the underground pipes for $5,770.

An appropriation of $30,000 has been asked of Congress for the completion of the heating apparatus throughout, for the gas and water fixtures and the electric apparatus required for clocks in the building, for signals, alarms, &c.

Before the building can be occupied it must, of course, be furnished and fitted up with cases, of which, as might be expected, a large provision is required. According to a calculation, the cases that will be needed, if placed end to end, will extend to a distance of more than 8,000 feet, with a total of shelving surface of about 75,000 square feet. The frontage of the cases will be over 14,000 feet, so that, allowing for the crossing from one case to another a journey of at least three miles will be required even to take a cursory glance at all the objects in the collection.

The question of the best material for the cases has not been definitely settled, the choice lying between iron and hard wood. In order to assist in determining this question satisfactorily, arrangements have been made to obtain working plans of the cases used not only in a number of museums in the United States, especially in Cambridge, Boston, and New York, but also in Europe. The new building now being erected for the collections of the British Museum is one where it is supposed the best experience has been made use of in the plans of the cases, and arrangements have been made to obtain copies of the same. The new iron cases of the National Museum at Dresden are also under investigation. Iron is more expensive than wood, but involves less danger of decay, and there is also an especial advantage in the fact that the material may be so much thinner as to increase the interior space, while the objects in the cases are less obscured. Of course, it must not be forgotten that the National Museum is expected to discharge its functions for an indefinite period of years.

The provision of Congress directed that the new building should be placed to the east of the present Smithsonian edifice, at least fifty feet from its southeastern corner. The question was considered of having the interval greater than this minimum, but it was found that this would involve the extension of the building beyond the boundary of the Smithsonian reservation and carry it to the unassigned portion of the square. Although there was nothing in the act to prevent this encroachment, yet in view of the possibility that the southeastern portion of the public land between Seventh and Twelfth streets would be required for some other purposes, perhaps for a Congressional Library, it was thought best to encroach upon it as little as possible.

In addition to its answering the purpose for which it was primarily intended, it is confidently believed that the new National Museum building will exercise an important function in serving as a model for similar establishments elsewhere.

Of course, in a city where the cost of land is a matter of important consideration, the one-story plan cannot always be carried out, the usual position of story above story being necessary to secure the desired space. Most colleges and universities, however, have ample grounds belonging to them, the occupation of which by large buildings is allowable. Under such circumstances, the same amount of fire-proof space can be had for from two-thirds to one-half the usual cost.

The office of member of the Building Commission has been by no means a sinecure, weekly meetings having been held, with scarcely an interruption, from the first organization, as shown by the full reports kept of the proceedings. General Meigs, as consulting engineer, until his recent departure on a tour of duty, was present at every meeting and continually aided the Commission by his advice, rendered so valuable by his long familiarity with building operations on a large scale, and with the whole question of the proper construction of contracts. He visited the grounds nearly every day and closely inspected the progress of the work. To him are also due valuable suggestions on the methods of covering the roofs and on other details.

The duties of the secretary of the commission have consisted in keeping the record of the proceedings of the meetings, in assisting in the preparation of contracts for execution, in engrossing the bills for settlement, and in many other points. These services Mr. Leech has zealously performed, and to the entire satisfaction of the commission.

Mr. William J. Rhees, chief clerk of the Smithsonian Institution, has also rendered valuable services.

Respectfully submitted.

W. T. SHERMAN,
PETER PARKER,
SPENCER F. BAIRD,
National Museum Building Commission.

ARCHITECTS' OFFICE, NATIONAL MUSEUM BUILDING,
Washington, D. C., January 1, 1880.

To the Hon. National Museum Building Commission, Washington, D. C.:

GENTLEMEN: We have the honor to submit the following report of the work done upon the erection of the fire-proof building for the National Museum from March 25, the date when the work was, by you, placed in our charge, to December 31, 1879.

It is due to the importance of this national and extensive enterprise to preface the report by a technical and descriptive record of its plan, design, and construction.

The building starts on the ground in the form of a square, with sides of 327 feet extreme length. This is surmounted by a cross and a dome. Within its façades a net area of 102,200 square feet, or 2.35 acres, is covered in by roofs.

It contains under ground a coal-cellar of a storage capacity of nearly 300 tons. Besides, there are two cellars, containing 3,200 square feet floor space, for storage purposes. From one of these cellars a subterranean communication with the adjacent Smithsonian building is established, by an arched passage, which, besides ordinary uses, will serve in cases of panic, fire, tumult, robbery, &c.

A basement containing 1,600 square feet of floor space is fitted up for the boiler-room of a steam heating apparatus.

On the main floor there are available, in 17 halls which freely communicate with one another by wide and lofty archways, 80,300 square feet of floor space and a proportionate amount of wall space for exhibition purposes.

Further, there are available on the main floor and two upper stories 27,400 square feet of floor space, divided off into 135 rooms for administrative functions, offices, working-rooms, photographer, necessary accommodations, &c.

And finally there are about 4,000 square feet of floor space on galleries, formed on a level with the second floor of the offices; these are intended in part for special exhibits and in part to afford an unobstructed view of the ensemble of the exhibits.

On the whole, the one-story plan which has prevailed among experts ever since the Paris exhibition of 1867 has been adopted. But by the introduction of upper stories on those outlying sections reserved for offices, ample office-room has been secured without encroaching materially upon the floor space within the square of 300 feet, to which the building was primarily limited.

The center of the building is octagonal on the ground floor, and is surmounted by a 16-sided polygon of 67 feet diameter, which contains a tier of large windows and constitutes a domical structure with a slate roof and a lantern, crowned by a decorated finial. This room is 77 feet high on the side walls, or 108 feet to the top of the finial.

Four naves, of 65 feet in width and 117 feet in length, radiate from the dome and extend to the outside walls of the building; the naves form in this manner a Greek cross, over the center of which the dome rises, and part of the spaces in the exterior angles of the cross are fitted up with halls of 65 feet square and of same height as the naves.

The side walls of both naves and annexes are 42 feet high, while the height to the ridge of the slate roofs is 56 feet. These roofs are in part constructed double, for the purpose of so perfecting the drainage of the roofs that accumulations of ice and snow can nowhere obstruct it.

The spaces between the high walls of the Greek cross and the exterior walls of the building are allotted mainly to eight halls of reduced height, covered by lean-to metal roofs; the extreme height of which is 32 feet.

By this treatment wall spaces are obtained for the introduction of clerestory windows, which light the square halls and assist in lighting the naves.

The four symmetrical exterior walls of the building are broken by projections in the center and at the corners, and these have been amply utilized for miscellaneous administrative purposes as stated above.

A modernized Romanesque style of architecture was adopted for the new building in order to keep up a relationship with the Smithsonian building, which is designed in Norman, a variety of this style. To modernize this style was found necessary on account of the different building material, and to do justice to the purposes of the building with its modern demands of perfect safety and elegance of construction, of greatest possible available floor space, of easy communications, efficient drainage, a well calculated and pleasing admission of light, free circulation of air, and all other hygienic dicta.

The external architecture is based upon the general arrangement of the interior, and shows plainly the prominence of the four naves and the careful management of the light for the central portion of the building. The main entrances are in the centers of each façade between two lofty towers of 86 feet height, which act as buttresses for the naves. Between the towers, and receding from the doorways, there are large arched windows set with ornamented glass, and above those the gables of the naves are formed; they contain inscription-plates and are crowned by allegorical groups of statuary. The group over the northern gable, designed by C. Buberl, of New York, already in position, introduces Columbia as the protectress of science and industry.

To both sides of these prominent central features there are curtain-walls, 27 feet in height, which have the effect of arcades.

Pavilions are placed at the corners; they are of less height than the towers, but sufficiently raised above the curtain-walls to overcome the unfavorable effect which these comparatively low walls would otherwise produce.

In the rear of the curtain-walls, the clerestory rises to the full height of the naves, the roofs of which terminate against the side walls of the dome. The dome is treated in a similar way and strictly in the same character as the curtain-walls above alluded to.

In addition to the windows in the solid masonry of exterior walls, clerestory, and dome, lofty lanterns have been provided above the naves and square halls so as to afford perfect light for this enormous space without resorting to flat skylights, which for various reasons it was well to avoid.

These lanterns, square and oblong, together with those of the kindred features of the pavilions, have been so arranged, in combination with towers, groups, clerestory, and the rising dome in the background, as to produce a picturesque effect in the sky-lines of the building.

All the masonry above ground is composed of brick-work, built with air spaces for outside walls, ornamented and laid in black mortar for the facing of exterior walls. To neutralize the monotony and commonplace appearance which could not have been avoided with red brick fronts of such extent, a sufficient quantity of buff bricks, interspersed with a small number of blue bricks, in the cornices have been introduced.

A base-course of granite extends all around the building.

The wrought work of the main entrance, window-sills, inscription-plates, copings, &c., are of gray Ohio freestone. Anything else in the line of decoration is in strict keeping with the principal designs, and executed in substantial metal work.

The floor beams, girders, and roofs consist or are constructed of rolled and shaped iron. The floors are fire-proofed by brick arches and concrete. Of roofs there are no less than thirty seven; many of them are of most complicated construction. The lanterns of the ridges of the naves are large enough to cover moderate-sized dwellings.

The light but solid frame-work of all the roofs will be left in full view, painted in light neutral tints.

The covering of the metal roofs is laid upon fire-proofed gratings, suggested by General M. C. Meigs.

The slates are hung to iron purlines.

The sashes all through the building are each glazed with two panes of glass, with an intermediate air-space. This is done to facilitate the heating of the building.

The floors of the exhibition halls will consist of concrete, but the rooms and smaller halls will, for convenience sake, be floored with Florida pine, laid on concrete.

The interior is to be plastered in sand finish, washed in tints. Its lofty proportions do not require any elaborate decoration, and will thus rather heighten than interfere with the objects on exhibition.

The heating of the building is to be done by low-pressure steam, on the system of direct radiation.

The wide main entrance doors of walnut and oak open outward on spacious tiled vestibules, with sides and arched ceilings of ornamental brick-work. These vestibules are closed at night and on Sundays by wide double gates, the solid frames of which consist of wrought iron, and the ornaments of cast iron; thus combining the utmost strength with great economy.

The northern entrance has been selected for general use, and hence it was necessary and proper to give it due prominence from the others for the guidance of strangers. The configuration of the surrounding ground helped in this connection. A spacious tiled platform bounded by granite side blocks is constructed in front of this entrance. It is approached by four low and wide granite steps of 37 feet in length, which are flanked by molded base-blocks, carrying stately candelabras.

It should be remembered that in all our steps we were guided by the absolute necessity not to overreach the appropriation at disposal; and hence, to produce the best effect with utmost economy, the exterior decoration was confined to and concentrated on the centers of the fronts.

The erection of this building requires about 5,250,000 bricks, 3,000 barrels cement, 5,600 barrels lime, 4,000 cubic yards of sand, 2,000 cubic yards of rubble-stone, 1,230 cubic yards of concrete, 470 tons of wrought iron, 31,000 square feet of glass, 60,000 plates of slate, of 2 square feet each, 375 boxes of tin, &c.

As soon as we received the required instructions our work was concentrated on the preparation of working drawings, schedules, and specifications, so as to take best advantage of the low prices of material and labor then prevailing, and in this we were successful to a great extent.

We now proceed to give a history of the progress of the work during the past season, operations being classed under a few general heads.

During the whole season we were favored by the weather. From the 1st of May to 31st of December but twelve and one-quarter working days were lost by inclement weather; of these, nine and three-quarter days were rainy, one was stormy, one severely cold, and a half a day was lost on account of sleet and ice.

1. *Excavation.*—The excavation for the foundations was commenced on the 17th of April and finished on the 28th of May. It was carried to solid ground, but nowhere less than 3 feet below surface, that the building should rest on earth below the disintegrating effects of frost and drought. Under the topsoil a thick stratum of hard clay was met, and under this a bed of clean, dry gravel, which was struck wherever cellars were dug; this porous layer drained the site by absorbing the rain-water as fast as it fell.

2. *Foundations.*—The foundations were, under date of April 29, commenced with a heavy bed of hydraulic cement concrete and were completed on the 30th of May. Upon the concrete bed they were continued

up to the surface with rubble-stone work of gneiss, laid in cement mortar; this work was commenced on the 5th of May and was completed on June 9.

3. *Brick-work.*—The brick-laying commenced on May 21, and the principal walls were completed on November 1, after 4,740,000 bricks had been laid under contract. The specifications call for a superior class of brick-work, laid in black mortar on the façades without resorting to the expensive "tucked" or "ruled" joints commonly used in first-class pressed brick-work, and this has been duly enforced. In this we were aided by the commendable ambition of the Washington Brick Machine Company, who have furnished a superior quality of brick for the façades. We, on the other hand, have spent a large amount of money in bringing out the beauty of the material by cleaning down and oiling the façades. Ever since the contract for laying bricks has been declared as satisfactorily completed a large force of brick-layers has been kept at work by the day, under proper superintendence, in finishing the façades, piecing out the walls, building the steam-chimney, walling in the iron-work of the roofs as they progressed, doing plumbers' jobbing, turning and concreting floor-arches, laying foundations for platforms and steps, forming gutters with due grade, &c., &c. This work is all well advanced, but still in progress, and will be finished by the building of ducts for the lines of pipes which will conduct the steam and return the condensed water of the heating apparatus.

4. *Cut-stone work.*—The cutting and laying of the granite base course was commenced on May 19. The cut-stone work has been going on during the whole season as the work of the other mechanics progressed and is now completed, with the exception of part of the outside steps. At intervals of about 5 feet in height, bond-stones of North River grey wacke-bluestone have been introduced in the high piers of the interior archways in order to increase their stability.

5. *Iron-work.*—The floor-beams arrived in good time and were put in place by the contractors as they got ready for them. On August 22, the first "Warren girder" of the lean-to roofs was set in place; on October 9 the roofs of the naves were commenced to be put up; on December 19 those of the square halls were commenced. At this writing all the material for the roofs is on hand; it simply remains for the contractor to display energy and have all the roofs ready for covering.

6. *Galvanized iron-work.*—This consists of a heavy amount of small cornice-moldings, of acroteria, chimney-heads, finials, facings and casings. It is well advanced at the shops and being put up in due time.

7. *Slates and slating.*—Under date of August 19 last, the blue slates have been ordered from Ore Banks, Va., and the red and green slates from the quarries in Vermont. They are virtually all on hand, and the slater avails himself at all times of the first opportunity which offers for laying the slates. The slates are 24 inches in length and expose 10 inches to the weather, thus giving what is termed double cover and 4 inches lap.

8. *Covering of the flat roofs.*—These metal roofs are supported primarily by the wrought-iron trusses laid 13 feet between centers; these again are subdivided and cross-laid by wrought beams of lighter sections so as to cut up the ceilings into spaces of 4 by 13 feet in size. At the suggestion of General Meigs these spaces were bridged by gratings formed in two thicknesses of light tapered wooden strips and fire-proofed by being filled in and inclosed with a non-conducting mixture composed of plaster of Paris, lime, coal-ashes, and cinders. Before actual use we have made ample tests in order to reduce the weight of the gratings and of the composition to a minimum, and on the other hand to increase its non-conductibility. The greater part of this work is done and the metal laid upon it in sheets of 14 by 20 inches in size, having flat joints. Each sheet is clamped down to the gratings by eight clamps of sheet metal, two on each side, in such a manner that each sheet, independent of all others, can expand and contract, which in such large roofs is an important consideration.

9. *Wooden floors.*—All the flooring required has been secured of Florida yellow pine, by contract, at very reasonable terms.

10. *Plastering.*—No scaffolding material being kept on hand by the tradesmen for reaching high walls or ceilings of buildings like this, the poles and lumber of the scaffolds for the brick-work were purchased at a reasonable rate from the contractors for that branch and are now on hand.

11. *Glass, glazing, and painting.*—With the sudden stimulus which the industries of this country received last fall, home-made glass came to be a scarce article, as the proposals received under extensively published advertisements show; the lowest bids were for Belgian glass, imported free of duty, with the approval of the Treasury Department. This glass is shortly expected to arrive, after which the sash will be glazed at an early date. The painting has so far been mostly confined to the metal cornices and piping, the iron-work and window-frames having been furnished, by the respective contractors, all primed.

12. *Carpenter's work.*—This has so far been mostly directed to the making of roof-gratings, described under another head. But, besides, a large amount of centers has been made and put up for turning arches in the brick-work and floor-arches. In the concrete above the floor-arches the thin sleepers have been laid to which the flooring is to be nailed. The setting of door-jambs is about to be commenced and to be followed by all the minor details required for getting the building in readiness for the plasterer

13. *Sewerage, drainage, and plumbing.*—In the early part of the spring the main sewer on B street was cut out and a 12-inch glazed terra cotta sewer connected with it for the drainage of the new building The numerous branch sewers within the building leading to some sixty conductors from the roofs, and to soil-pipes of closets and basins, were under a decision of the commission delayed until the completion of the walls, but have lately been completed, as also most of the extra heavy

cast-iron piping which forms the conductors of rain-water, and the vertical soil-pipes. All these heavy pipes have air and water tight joints formed of gasket and lead, and are firmly supported by brick piers at their juncture with the sewer-pipes under ground.

During the progress of the brick-work temporary supplies have been taken by tapping the pipes supplying the hose-cocks in the Smithsonian grounds, but in the fall a 12-inch main pipe was tapped outside of the building and near its southeastern corner. Three parallel lines of 3-inch water-pipe running due north through the building were put in with supply for 16 fire-plugs, numerous street-washers, outlets for closets, basins, and bath-tubs, stop-cocks, &c.

Simultaneously with the water supply the supply-pipes for gas were attended to. The gas main was tapped on B street, outside of the southwest corner of the building, and two 4-inch supply-pipes were put in, one running due north and the other due east through the building, at an equal distance of about 20 feet from the outside walls of the building. Both pipes are continued, of reduced sizes, in a similar way until they meet at the northeast corner of the building. They have a regular fall back to the main, the permanence of which is secured by two supporting brick piers under each length of pipe, so that no flickering of gas can ever occur in consequence of the formation of traps by irregular settlements of the pipes. Outlets have been provided for lighting all the rooms and passages, and also for the light required to supervise all the parts of the building at night. Unusually large gas-pipes were found necessary on account of the great lengths on which they are run, and this feature will afford facilities hereafter, in case it should be decided to fit up any of the halls with brilliant light for public use at night.

14. *Underground piping for heating apparatus.*—To avoid the unsightly appearance of exposed large-sized steam and water return-pipes required for the successful heating of the vast building, it was decided to build the necessary ducts and introduce the pipes under ground before the floors were laid, though this part of the work was not included in the estimates on which the appropriation for the building proper was based.

The heating apparatus intended under the estimates, now before the Appropriation Committee of the House, provides for four steam-boilers of 256 nominal horse-power in the aggregate. The generated steam is to be conducted by two separate main pipes of eight inches diameter to about 200 steam-heaters, containing in the aggregate 13,680 square feet of radiating surface. The hot water condensed in these heaters is to be returned and reused in the boiler.

FINANCIAL STATEMENT.

Expenditures up to date.

Earth-work:		
Excavation	$724 43	
Grading	129 25	
		$853 68

Foundations:			
A. Concrete:			
Concrete stone		$2,083 32	
Cement		1,084 24	
Sand		300 00	
Labor		431 46	
			$3,899 02
B. Rubble-stone work:			
Rubble-stone		3,394 36	
Cement		1,000 00	
Sand		295 00	
Labor		2,321 28	
			7,010 64
Brick-work:			
Red bricks		31,512 24	
Buff and blue bricks		3,270 73	
Blackening bricks		1,235 05	
Lime and cement		2,789 65	
Sand		2,240 14	
Pulp-black for mortar		262 95	
Centers		866 37	
Laying under contract		16,799 30	
Laying by day's work		3,597 84	
Miscellaneous expenses		1,447 11	
			64,021 38
Cut-stone work			9,097 60
Wrought and cast iron work:			
Floor-beams		3,230 52	
Hoop-iron for anchors		242 70	
Roofs and anchors		16,401 80	
Setting beams, &c		592 31	
			20,467 33
Galvanized iron-work			2,016 00
Slating:			
Cost of slate for roof		3,972 32	
Cost of slate for isolating course of foundation		245 80	
Cement		88 34	
Labor		123 26	
			4,429 72
Covering of flat roofs:			
A. Fire-proof gratings:			
Plaster of Paris	484 65		
Lime	100 00		
Strips	3,519 65		
Ashes	110 45		
Hair	60 00		

Labor of carpenters	$3,275 11		
Labor of plasterers	819 50		
		$8,369 36	
B. Roofing:			
Manila felt	1,145 96		
Redipped tin	3,043 59		
Labor	400 05		
		4,589 60	
			$12,958 96
Plastering, poles, ropes, and lumber			591 35
Painting:			
Material		213 60	
Labor		216 75	
			430 35
Plumbing, sewerage, and drainage			1,386 96
Carpenters' work, lumber, and hardware:			
Window-frames		1,480 75	
Miscellaneous lumber		935 41	
Hardware		404 89	
			2,821 05
Decorations			2,000 00
Construction and superintendence			5,000 00
Miscellaneous expenses:			
A.—Survey and levels of ground, clearing of site, repairs to roads, &c			1,206 55
B.—Printing, advertising, and photographic copies for circulation among bidders			1,377 14
C.—Platform scales, tools, models, and sheds			1,036 71
D.—Clerical services and watchmen			1,571 00
E.—Stationery, office-furniture, telegraph attachment and service, traveling expenses and other incidentals			970 94
Total expenditures to January 1, 1880			$143,146 38
Amount appropriated by Congress			250,000 00
Balance to credit of the building under date of January 1, 1880			106,853 62
The materials for the completion of the building are mostly engaged under existing contracts, and represent a liability of			58,853 62
Hence, balance remaining for labor of finishing and for completing the required material			$48,000 00

This balance is sufficient to justify the expectation that the building will be completed within the appropriation, ready for receiving the heating apparatus and glass cases.

CONTRACTS.

The contracts entered into and their present condition are enumerated in the adjoining table:

Contracts and accepted proposals entered into and in force during the progress of the work.

Date of contract.	Description of work.	Name of contractor.	Rate.	Specified amount.	Present condition.
1879.					
Apr. 14	Sand	John Miller	73 cents per cubic yard.		In force.
Apr. 21	Gneiss rubble stone	Jos. A. Blundon	$1.69 per cubic yard.		Complete.
Apr. 23	Grading	Gleeson & Himber		$129 20	Do.
Apr. 23	Excavating	do	14¾ cents per cubic yard.		Do.
Apr. 23	Concrete foundations: Labor	do	35 cents per cubic yard.		Do.
Apr. 23	Rubble-stone masonry: Labor	do	$1.15 per cubic yard.		Do.
Apr. 23	Concrete stone: Material	do	$1.69 per cubic yard.		Do.
Apr. 26	Cut-stone work	Rothwell & Lloyd		7, 446 21	
	Material and labor:		75 cents per linear foot for additional window-sills. 45 cents additional per square foot for bond-stones.		Complete.
Apr. 30	Lime	Carson & Son, of Riverton, Vt.	63 cents per barrel of 200 lbs.		In force.
Apr. 30	Cement	Cumberland Hydraulic Cement Company.	87 cents per 300 pounds.		Do.
May 10	Window frames and sash.	Barber, Henderson & Co.		4, 678 80	Do.
May 23	Brick-work (labor)	Gleeson & Himber	$3.37 per M.		Complete.
June 12	Bricks	Washington Brick Machine Company.	Common, $6.23 per M.; Face, $8.23 per M.		In force.
June 19	Rolled-iron beams	New Jersey Steel and Iron Co., Trenton.	Extra beams, 2.35 cents per lb., delivered.	2, 865 00	Complete.
July 7	Iron roofs, stairs, railings.	C. A. Schneider & Sons		36, 856 39	In force.
July 12	Galvanized-iron work, material and labor.	Stockstill & Co		4, 399 89	Do.
July 12	Drainage, material, labor.	Blinkhorn & Hannan		2, 312 26	Do.
July 22	Slaters' work and fastenings.	Jno. O. Jones	$.165 per square, and 75 cents additional for any double fastenings.		Do.
Aug. 14	Blue slate	Ed. Roberts, of Ore Banks, Va.	$4.80 per square		Do.
Aug. 14	Red slate and green slate.	Story & Wilbur, of Boston.	Green, $6.20; red, $9.10 per square.		Complete.
Dec. 9	Interior doors and frames.	Jos. Thomas & Son, Baltimore.		1, 241 00	In force.
Dec. 24	Main-entrance doors	Aug. Grass		730 00	Do.
1880.					
Jan. 10	Underground piping for heating.	Baker, Smith & Co., New York.		5, 770 00	Do.
Jan. 10	Florida pine flooring	Thos. W. Smith	$30.75 per M. B. M.		Do.

In conclusion, we beg to state that in addition to our steady personal attendance we have kept constantly upon the ground, up to the close of the season, a general superintendent in the person of Mr. John H. Bird; and that Mr. W. W. Karr, the clerk in charge of platform scales, time books, and the miscellaneous office duties connected with the progress of the work, has rendered our duties easier by hearty co-operation. We are indebted to him for the record of many of the details contained in this report.

We have the honor to be, very respectfully, your obedient servants,

CLUSS & SCHULZE,
Architects.

JOURNAL OF THE PROCEEDINGS OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION.

WASHINGTON, D. C., *January* 17, 1880.

The annual meeting of the Board of Regents of the Smithsonian Institution was held this day at 10 o'clock a. m., in the Regents' room.

Present, the Chancellor, Chief-Justice Waite; Hon. Wm. A. Wheeler, Vice-President of the United States; Hon. H. Hamlin, Hon. R. E. Withers, Hon. N. Booth, Hon. J. A. Garfield, Hon. Hiester Clymer, Hon. Joseph E. Johnston, Dr. John Maclean, Dr. Asa Gray, Hon. Peter Parker, President Noah Porter, General Wm. T. Sherman, and the Secretary, Professor Baird.

(Dr. H. Coppée, the only member of the Board absent, was accidentally detained on the road, and did not reach Washington until after the adjournment of the Board.)

The Secretary made the following announcements relative to the appointment of members of the Board of Regents.

The vacancy in the Board occasioned by the expiration of the term of Hon. A. A. Sargent, of California had been filled on the 21st of March, 1879, by the appointment by the President of the Senate of Hon. Newton Booth, of California.

On the 4th of April, 1879, the Speaker of the House of Representatives, Hon. S. J. Randall, had reappointed as Regents Hon. H. Clymer of Pennsylvania and Hon. J. A. Garfield of Ohio, and had appointed Hon. Joseph E. Johnston of Virginia *vice* Hon. Alex. H. Stephens, who had declined reappointment.

A joint resolution had passed Congress and been approved by the President of the United States December 19, 1879, providing that the "vacancies in the Board of Regents of the class other than members of Congress shall be filled by the reappointment of Asa Gray of Massachusetts, Henry Coppée of Pennsylvania, John Maclean of New Jersey, and Peter Parker of the city of Washington, whose terms have expired."

The minutes of the Board of January 16, 1879, were read, and, after slight amendment, approved.

The Secretary presented a statement of the financial condition of the Institution, and stated that in order to save time this statement and all the accounts of the Institution had been referred to the Executive Committee.

Dr. Parker, from the Executive Committee, presented and read the annual report of the committee relative to the receipts and expenditures of the Institution and the National Museum for the year 1879, the condition of the funds, estimates for the year 1880, &c.

On motion of General Garfield, it was—

Resolved, That the report of the Executive Committee for 1879 be accepted.

Resolved, That the income for the year 1880 be appropriated for the service of the Institution upon the basis of the above report, to be expended by the Secretary with full discretion as to the items, subject to the approval of the Executive Committee.

Dr. Gray, from the committee on the Henry memorial, reported that the material for the volume had been collected, and was now in the hands of the Public Printer.

On motion of Dr. Withers the committee was continued, and further time granted.

Dr. Parker called attention to the fact that the resolution of the 17th of January, 1879, limited the allowance to the Secretary for house-rent, &c., to the 31st of December, 1879.

On motion of Mr. Hamlin, it was—

Resolved, That the Secretary of the Institution be allowed the sum of one hundred and twenty-five dollars per month for rent, fuel, gas, &c.

On motion of Dr. Parker, it was—

Resolved, That an allowance of one hundred and fifty dollars be made to defray the funeral expenses of the late Tobias N. Woltz, who was superintendent of the building for twenty-two years.

General Sherman presented and read the report of the National Museum Building Commission appointed by resolution of the Board January 17, 1879.

He also presented the report of the architects, Messrs. Cluss & Schulze.

On motion of Mr. Clymer, the reports were accepted.

On motion of General Garfield, it was—

Resolved, That the Board of Regents hereby express their high appreciation of the contribution made to science by the late Simeon Habel, and of the bequest which he made to the Smithsonian Institution.

The Secretary presented his annual report of the operations of the Institution for the year 1879, which was read, and, on motion of General Sherman, it was—

Resolved, That the report be accepted and transmitted to Congress.

The Board then adjourned *sine die.*

JAMES SMITHSON AND HIS BEQUEST.

By William J. Rhees.

James Smithson was born in England about the year 1754, the precise date and place of his nativity being unknown.* He was a natural son of Hugh Smithson, first Duke of Northumberland, his mother being a Mrs. Elizabeth Macie, of an old family in Wiltshire of the name of Hungerford. Nothing has been learned of her history.

Hugh Smithson, his father, was distinguished as a member of one of the most illustrious houses of Great Britain, and also because of his alliance with the renowned family of Percy.

The Smithson baronetcy arose with an earlier Hugh Smithson, the second son of Anthony Smithson, esq., of Newscome or Newsham, in the parish of Kirby-on-the-Mount, Yorkshire, who was thus rewarded by Charles II in 1660, for his services in the royalist cause during the civil wars. His grandson, Sir Hugh Smithson, married Elizabeth, daughter of the second Lord Langdale, and had two sons. Hugh, the eldest, died unmarried, before his father; Langdale, the second son, married Miss Revely, by whom he left one son, Hugh. This son succeeded his grandfather as Sir Hugh Smithson, of Stanwick, in 1750, and was the father of the subject of the present sketch. He married Lady Percy on the 16th July, 1740. Her father inherited the Dukedom of Somerset in 1741, and was created Earl of Northumberland in 1749. On his death, in 1750, Sir Hugh Smithson succeeded to these honors and on the 22d of October, 1766, was created first Duke of Northumberland † and Earl Percy, with succession to his heirs male; and finally in 1784 the barony of Lovaine of Alnwick was added to his accumulated dignities.

The Duchess died in 1776. The Duke survived till 1786,‡ and was succeeded by his son Hugh (half brother of James Smithson), as the second Duke of Northumberland.§

Hugh Smithson, the first Duke of Northumberland, had (besides James Smithson) another natural son, who was known as Henry Louis Dickinson. He received a good education, entered the military service, was commissioned lieutenant-colonel on the 1st of January, 1800, and on the 4th of August, 1808, took command of the Eighty-fourth Regiment of Foot. He saw active service on the Continent and in Asia and Africa. His estate was left to the care of his half-brother, Mr. James Smithson, in trust for the benefit of his son, and this was probably the source of a large part of the fund which eventually came to the United States.

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*See Appendix. Note 3.

†There was a previous Duke of Northumberland who died without issue in 1716, and the title became extinct.

‡See Appendix. Note 2.

§See Appendix. Note 3.

The possession by the first Duke of Northumberland of titles and dignities only inferior to those of royalty was of little consequence to his son James Smithson. Deprived by the bar sinister on his escutcheon from claiming the family name and honors, he nevertheless aspired to win a fame more universal and lasting than these could have bestowed upon him. He devoted himself to original research in the field of science, and sought to be known and honored by his fellow-men as a discoverer of new truths. Moreover, he resolved to attach his name to an institution unique in its character, noble in its object, and universal in its beneficence, of which John Quincy Adams has well said, "Of all the foundations of establishments for pious or charitable uses which ever signalized the spirit of the age or the comprehensive beneficence of the founder, none can be named more deserving of the approbation of mankind."

Smithson's feeling in regard to posthumous fame was strikingly expressed in the following sentence found in one of his manuscripts.

"The best blood of England flows in my veins; on my father's side I am a *Northumberland*, on my mother's I am related to kings, but this avails me not. My name shall live in the memory of man when the titles of the Northumberlands and the Percys are extinct and forgotten."

As Prof. W. R. Johnson has well observed in speaking of Smithson: "The man of science is willing to rest on the basis of his own labors alone for his credit with mankind, and his fame with future generations. In the view of such a man, the accidents of birth, of fortune, of local habitation, and conventional rank in the artificial organization of society, all sink into insignificance by the side of a single truth of nature. If he have contributed his mite to the increase of knowledge; if he have diffused that knowledge for the benefit of man, and above all, if he have applied it to the useful, or even to the ornamental purposes of life, he has laid not his family, not his country, but the world of mankind under a lasting obligation."

The eloquent words of John Quincy Adams in reference to the fame to be conferred on Smithson by the successful accomplishment of the great design he had in view by his bequest are appropriate in this connection.

"The father of the testator upon forming his alliance with the heiress of the family of the Percys, assumed, by an act of the British Parliament, that name, and, under it, became Duke of Northumberland. But renowned as is the name of Percy in the historical annals of England; resounding as it does from the summit of the Cheviot Hills to the ears of our children in the ballad of Chevy Chace, with the classical commentary of Addison; freshened and renovated in our memory as it has recently been from the purest fountain of poetical inspiration in the loftier strain of Alnwick Castle, tuned by a bard from our own native land (Fitz Greene Halleck); doubly immortalized as it is in the deathless dramas of Shakspeare; 'confident against the world in arms,' as it may have been in ages long past and may still be in the virtues of its present possessors by inheritance, let the trust of James Smithson to the United States of America be faithfully executed by their representatives in Congress, let the result accomplish his object, 'the increase and diffusion of knowledge among men,' and a wreath of more unfading verdure shall entwine itself in the lapse of future ages around the name of SMITHSON, than the united hands of tradition, history, and poetry have braided around the name of Percy through the long perspective in ages past of a thousand years."

The Duke of Northumberland provided a liberal education for his son James, who pursued his studies at Oxford University, where he became attached to Pembroke College, distinguished for having among its fellows the learned Blackstone, the eloquent Whitfield, and the celebrated Dr. Samuel Johnson. Here the young student was noted for diligence, application, and good scholarship, and attracted marked attention by his proficiency in chemistry. His vacations were passed in excursions to collect minerals and ores which it was his favorite occupation to analyze. At Oxford he received the impulse for scientific research which characterized all his future life, and the ardent desire not only to advance knowledge himself but to devote in after years his whole fortune to provide means by which others could prosecute this high and noble pursuit.

He was graduated at Pembroke College on the 26th of May, 1786, as JAMES LEWIS MACIE,* by which name he seems at that time to have been known, and which he retained for about fourteen years, when he adopted that of JAMES SMITHSON.†

Smithson never married, and as a man of wealth had ample opportunity for leisure or the indulgence of mere personal gratification. But idleness and pleasure were not compatible with the spirit and ardor of the young student of chemistry. He diligently pursued his investigations, and his ambition to become associated with the votaries of science induced him to seek membership in the Royal Society of London.

"The Royal Society of London," says Arago, "enjoys throughout the whole kingdom a vast and deserved consideration. The philosophical transactions which it publishes have been for more than a century and a half the glorious archives in which British genius holds it an honor to deposit its titles to the recognition of posterity. The wish to see his name inscribed in the list of fellow-laborers in this truly national collection beside the names of Newton, Bradley, Priestley, and Cavendish, has always been among the students of the celebrated universities of Cambridge, Oxford, Edinburgh, and Dublin, the most anxious as well as legitimate object of emulation. Here is always the highest point of ambition of the man of science."

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* So given in the Oxford Catalogue. In the Philosophical Transactions and the Gentleman's Magazine the name is given as James *Louis* Macie.

† His second paper in the Philosophical Transactions, 1802, is by James Smithson. Sir Davies Gilbert, in his eulogy of him in 1830, calls him James Lewis Smithson.

The following is the official recommendation of his application to the society, bearing the signatures of some of its most illustrious members:

"James Lewis Macie, Esq., M. A., late of Pembroke College, Oxford, and now of John Street, Golden Square—a gentleman well versed in various branches of Natural Philosophy, and particularly in Chymistry and Mineralogy, being desirous of becoming a Fellow of the Royal Society, we whose names are hereto subscribed do, from our personal knowledge of his merit, judge him highly worthy of that honour and likely to become a very useful and valuable Member."

RICHARD KIRWAN.
C. F. GREVILLE.
C. BLAGDEN.
H. CAVENDISH.
DAVID PITCAIRN.

He was admitted a fellow on the 26th of April, 1787, in less than one year after leaving the university.*

Smithson's lodgings for some time were in Bentinck street, a locality famous as the place where Gibbon wrote much of his "Decline and Fall of the Roman Empire." Here, with authors, artists, and savans, Smithson found congenial fellowship. His mind was filled with a craving for intellectual development, and for the advancement of human knowledge. To enlarge the domain of thought, to discover new truths, and to make practical application of these for the promotion of civilization, were the great ends he had constantly in view.

For purposes of scientific inquiry he engaged in extensive tours in various parts of Europe; making minute observations wherever he went on the climate, the physical features and geological structure of the locality visited, the characteristics of its minerals, the methods employed in mining or smelting ores, and in all kinds of manufactures.

These numerous journeys and sojourns abroad gave him a cosmopolitan character, and illustrated one of his own sayings: "the man of science is of no country, the world is his country, all mankind his countrymen." This fact is exemplified by the life of Smithson—born in England, spending most of his time in France and Germany, buried in Italy, and leaving his name and fortune to the United States of America.

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* *Extract from Journal Book of the Royal Society.*

Ordinary meeting, Jan. 18, 1787.—Certificates were read recommending for election Louis Pinto de Sousa Coutinho, Knight of the Orders of Malta and Christ, and Envoy Extraordinary and Minister Plenipotentiary from the Queen of Portugal to the Court of Great Britain. Also Sir Thomas Gery Cullum, Bart., of Bury Saint Edmunds, in Suffolk, and JAMES LEWIS MACIE, Esq., M. A., late of Pembroke College, Oxford, and now of John Street, Golden Square.

April 19, 1787.—Louis Pinto de Sousa Coutinho, Portuguese Minister at the Court of Great Britain, Sir Thos. Gery Cullum, Bart., and JAMES LEWIS MACIE, Esq., Certificates in whose favour had hung the usual time in the Meeting Room were put to the ballot and chosen into the Society,

April 26, 1787.—JAMES LEWIS MACIE, Esq., and Sir Thos. Gery Cullum, Bart., elected at a former meeting attended. They paid their admission fees, compounded for Annual Contributions, and having signed the obligation in the Charter book were admitted fellows of the Society.

Desiring to bring to the practical test of actual experiment every thing that came to his notice, he fitted up and carried with him a portable laboratory. He collected also a cabinet of minerals composed of thousands of minute specimens, including all the rarest gems, so that immediate comparison could be made of a novel or undetermined specimen, with an accurately arranged and labeled collection. With minute balances, his weights scarcely exceeding a gram, and with articles so delicate as to be scarcely visible, he made the most accurate and satisfactory determinations. With a few pieces, not exceeding half a cubic inch in size, of tabasheer, a substance found in the hollow of bamboo canes, he made over two hundred and fifty different experiments.*

The value which Smithson placed on such minute researches is incidentally shown by a remark in his paper on "fluorine." He says, "there may be persons who, measuring the importance of the subject by the magnitude of the object, will cast a supercilious look on this discussion; but the particle and the planet are subject to the same laws, and what is learned of the one will be known of the other."

Smithson's ardor for knowledge and his zeal as a collector of new and rare minerals exposed him sometimes to hardship and privation. An interesting account of one of his journeys is given in his private journal.

In 1784, in company with Mr. Thornton, Mons. Faujas de St. Fond, the celebrated geologist of France, the Italian Count Andrioni, and others, he made a tour through New Castle, Edinburgh, Glasgow, Dumbarton, Tarbet, Inverary, Oban, Arran, and the island of Staffa.

As stated in Mr. Smithson's journal, the party had arrived at a house on the coast of Mull, opposite the island, and the journal continues:

"Mr. Turtusk got me a separate boat; set off about half-past eleven o'clock in the morning, on Friday, the 24th of September, for Staffa. Some wind, the sea a little rough; wind increased, sea ran very high; rowed round some part of the island, but found it impossible to go before Fingal's cave; was obliged to return; landed on Staffa with difficulty; sailors press to go off again immediately; am unwilling to depart without having thoroughly examined the island. Resolve to stay all night. Mr. Maclaire stays with me; the other party which was there had already come to the very same determination; all crammed into one bad hut, though nine of ourselves besides the family; supped upon eggs, potatoes, and milk; lay upon hay, in a kind of barn." (The party, be it remembered, embraced two English gentlemen, one French savant, one Italian count.)

"25th. Got up early, sea ran very high, wind extremely strong—no boat could put off. Breakfasted on boiled potatoes and milk; dined upon the same; only got a few very bad fish; supped on potatoes and milk; lay in the barn, firmly expecting to stay there for a week, without even bread."

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* See Appendix. Note 4.

"*Sunday the 26th.*—The man of the island came at five or six o'clock in the morning to tell us that the wind was dropped, and that it was a good day. Set off in the small boat, which took water so fast that my servant was obliged to bail constantly—the sail, an old plaid—the ropes, old garters."

On the 29th, the tourists are at Oban, where a little circumstance is noted, which significantly marks the zeal and activity of the collector of minerals and fossils, and the light in which devotion to geology is sometimes viewed.

"*September* 29.—This day packed up my fossils in a barrel, and paid 2*s.* 6*d.* for their going by water to Edinburgh. Mr. Stevenson charged half a crown a night for my rooms, because I had brought '*stones and dirt*,' as he said into it."

A month later he visited Northwich.

"*October* 28.—Went to visit one of the salt mines, in which they told me there were two kinds of salt. They let me down in a bucket, in which I only put one foot, and I had a miner with me. I think the first shaft was about thirty yards, at the bottom of which was a pool of water, but on one side there was a horizontal opening, from which sunk a second shaft, which went to the bottom of the pit, and the man let us down in a bucket smaller than the first."[*]

These incidents indicate the character of Smithson as a scientific enthusiast, not easily deterred by the fear of personal inconvenience from the pursuit of his favorite object.

Much of his life was passed on the Continent, in Berlin, Paris, Rome, Florence, and Geneva, enjoying everywhere the friendship and respect of the leading men of science,[†] and always devoting himself to the study of physical phenomena. Distinguished authors, as Gay-Lussac, Marcet, Haüy, Berzelius, and Cordier, presented him with their scientific papers[‡] as soon as published, and he enjoyed intimate association and correspondence with Davy, Gilbert, Arago, Biot, Klaproth, Black, and others.[§]

As a chemist, Sir Davies Gilbert, President of the Royal Society, pronounced Smithson to be the rival of Wollaston, of whom Magendie said, "his hearing was so fine he might have been thought to be blind, and his sight so piercing he might have been supposed to be deaf." It is related of him that he made a galvanic battery in a thimble, and a platinum wire much finer than any hair.

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[*] *Smithsonian Miscell. Coll.*, No. 327, p. 140.

[†] Galton, in speaking of Erasmus Darwin, remarks: "He was held in very high esteem by his scientific friends, including such celebrities as Priestley and James Watt, and it is by a man's position among his contemporaries and competitors that his work may most justly be appraised." Francis Galton, *English Men of Science.*

[‡] See Appendix.—Note 5.

[§] See Appendix.—Note 6.

Prof. Walter R. Johnson has made the following remarks respecting Smithson:

"It appears from his published works that his was not the character of a mere amateur of science. He was an active and industrious laborer in the most interesting and important branch of research—mineral chemistry. A contemporary of Davy and of Wollaston, and a correspondent of Black, Banks, Thomson, and a host of other names renowned in the annals of science, it is evident that his labors had to undergo the scrutiny of those who could easily have detected errors, had any of a serious character been committed. His was a capacity by no means contemptible for the operations and expedients of the laboratory. He felt the importance of every help afforded by a simplification of methods and means of research, and the use of minute quantities and accurate determinations in conducting his inquiries."

Smithson says in one of his papers, "chemistry is yet so new a science," what we know of it bears so small a proportion to what we are ignorant of; our knowledge in every department of it is so incomplete, consisting so entirely of isolated points, thinly scattered, like lurid specks on a vast field of darkness, that no researches can be undertaken without producing some facts leading to consequences which extend beyond the boundaries of their immediate object."*

Many of these "lurid specks" in the vast field of darkness of which Smithson spoke so feelingly, have, Prof. Johnson observes, "since his days of activity expanded into broad sheets of light. Chemistry has assumed its rank among the exact sciences. Methods and instruments of analysis unknown to the age of Smithson have come into familiar use among chemists. These may have rendered less available for the present purposes of science than they otherwise might have been, a portion of the analysis and other researches of our author. The same may, however, be said of nearly every other writer of his day."

Although his principal labors were in analytical chemistry, he distinguished himself by his researches in mineralogy and crystallography, in all his work exhibiting the most careful and minute attention to accuracy.† In his second published paper, he observes: "It may be proper to say that the experiments have been stated *precisely* as they turned out, and have not been in the least degree bent to the system."

That he pursued his investigations in a philosophic spirit, and with proper methods, is evident from the favor with which his contributions to the scientific societies and transactions of the day were received by his contemporaries, and the fact that the results he reached are still accepted as scientific truths.‡

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*A chemical analysis of some calamines. *Smithsonian Miscell. Coll.*, No. 327, p. 26.

† He carefully noted on the margins of his books mistakes in grammar or orthography, and frequently corrected erroneous statements or improper references in the indexes.

‡ An account of some of Smithson's experiments and copies of his notes on minerals and rocks are given in a paper on the works and character of James Smithson, by Dr. J. R. McD. Irby. *Smithsonian Miscell. Collections*, No. 327, 1879, p. 143.

In one of his essays, he divides the sources of knowledge into, 1st, observation; 2d, reasoning; 3d, information; 4th, conjecture. In all his researches he began the process of acquisition by *observing.*

One of his sentiments has been adopted as the motto on the publications of the Smithsonian Institution; viz: "*Every man is a valuable member of society, who, by his observations, researches, and experiments, procures knowledge for men.*"

In a critical notice of Davy's Elements of Chemical Philosophy in the Quarterly Review for 1812, the writer speaking of recent advances in chemistry, and especially in the establishment and extension of the law of definite proportions, remarks: "For these facts the science is principally indebted, after Mr. Higgins, to Dalton, Gay-Lussac, Smithson, and Wollaston."*

The mineral species "*Smithsonite*," a carbonate of zinc, was discovered and analyzed by him, among some ores from Somersetshire and Derbyshire, England. The name, Smithsonite, appears to have been conferred on it by the great French mineralogist Beudant.

It is interesting to notice the number and variety of specimens from the vegetable kingdom that Smithson subjected to analysis. They include the violet, red rose, red clover, daisy, blue hyacinth, hollyhock, lavender, artichoke, scarlet geranium, red cabbage, radish, poppy, plum, pomegranate, mulberry, cherry, currant, buckthorn berries, elder and privet berries. He also examined the coloring matter of animal greens.

It is perhaps worthy of note that his first paper related to an article of importance in the *materia medica*, and his last to a matter of practical value to artists. He by no means confined his attention to abstract science, but contributed knowledge of improved methods of constructing lamps, and of making tea and coffee. That such practical questions might be considered of little importance by men of science he seems to acknowledge by the remarks he makes in one of his papers.

"It is to be regretted," he observes, "that those who cultivate science frequently withhold improvements in their apparatus and processes, from which they themselves derive advantage, owing to their not deeming them of sufficient magnitude for publication. When the sole view is to further a pursuit of whose importance to mankind a conviction exists, all that can should be imparted, however small may appear the merit which attaches to it."†

A secretary of the French Academy deemed it his duty to offer an excuse for having given a detailed account of certain researches of Leibnitz, which had not required great efforts of the intellect. "We ought," says he, "to be very much obliged to a man such as he is, when he condescends, for the public good, to do something which does not partake of genius." Arago remarked in his eulogy on Fourier, "I cannot conceive the ground of such scruples; in the present day the sciences are regarded from too high a point of view to allow us to hesitate in placing in the first rank of the labors with which they are adorned those which diffuse comfort, health, and happiness amidst the working population."

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* *Quarterly Review*, 1812, vol. viii, p. 77.

† Some improvements of lamps. *Smithsonian Miscell. Coll.* No. 327, p. 78.

In another of his papers Smithson says, referring to practical investigations:

"In all cases means of economy tend to augment and diffuse comfort and happiness. They bring within the reach of the many what wasteful proceeding confines to the few. By diminishing expenditure on one article they allow of some other enjoyment which was before unattainable. A reduction in quantity permits an indulgence in superior quality. In the present instance the importance of economy is particularly great since it is applied to matters of high price, which constitute one of the daily meals of a large portion of the population of the earth."

"That in cookery also the power of subjecting for an indefinite duration to a boiling heat, without the slightest dependiture of volatile matter, will admit of a beneficial application, is unquestionable." *

In the books of his library are found numerous marginal notes, indicating his special attention to subjects relating to the health, comfort, resources, and happiness of the people.

Among his effects were several hundred manuscripts and a great number of notes or scraps on a variety of subjects, including history, the arts, language, rural pursuits, &c. On the subject of "habitations" were articles classified under the several heads of situation, exposure, exterior and interior arrangements, building materials, contents and adornment of rooms, furniture, pictures, statuary, &c. It is not improbable that he contemplated the preparation of a cyclopedia or philosophical dictionary.

Smithson's contributions to scientific literature consist of twenty-seven papers, eight published in the Philosophical Transactions of the Royal Society, in the years 1791, 1802, 1806, 1808, 1811, 1812, 1813, and 1817, and nineteen in Thomson's Annals of Philosophy, a journal of the highest scientific character, in 1819, 1820, 1821, 1822, 1823, 1824, and 1825. These papers have recently been collected and reprinted by the Smithsonian Institution.† Several of them were previously republished in foreign scientific journals translated by himself.

It is highly probable that Smithson contributed articles to scientific and literary journals other than those mentioned, but they have not yet been discovered.

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* An improved method of making coffee. *Smithsonian Miscell. Coll.*, No. 327, p. 88.

† *Smithsonian Miscell. Coll.*, No. 327, 1879, 8 vo., 166 pp.

The following is a list of his scientific writings:

[In the Philosophical Transactions of the Royal Society of London.]

1791. An account of some chemical experiments on Tabasheer, vol. lxxxi, pt. II, p. 368.
1802. A chemical analysis of some Calamines, vol. xciii, p. 12.
1806. Account of a discovery of native minium, vol. xcvi, pt. I, p. 267.
1807. On quadruple and binary compounds, particularly sulphurets, [Philosophical Magazine, vol. xxix, p. 275.]
1808. On the composition of the compound sulphuret from Huel Boys, and an account of its crystals, vol. xcviii, p. 55.
1811. On the composition of zeolite, vol. ci, p. 171.
1813. On a substance from the elm tree, called ulmin, vol. ciii, p. 64.
1813. On a saline substance from Mount Vesuvius, vol. ciii, p. 256.
1817. A few facts relative to the coloring matter of some vegetables, vol. cviii., p. 110.

[In Thomson's Annals of Philosophy.]

1819. On a native compound of sulphuret of lead and arsenic, vol. xiv, p. 96.
1819. On native hydrous aluminate of lead, or plomb gomme, vol. xiv, p. 31.
1820. On a fibrous metallic copper, vol. xvi, p. 46.
1820. An account of a native combination of sulphate of barium and fluoride of calcium, vol. xvi, p. 48.
1821. On some capillary metallic tin, vol. xvii. New series, vol. I, p. 271.
1822. On the detection of very minute quantities of arsenic and mercury, vol. xx. New series, vol. iv, p. 127.
1822. Some improvements of lamps, vol. xx. New series, vol. iv, p. 363.
1823. On the crystalline form of ice, vol. xxi. New series, vol. v, p. 340.
1823. A means of discrimination between the sulphates of barium and strontium, vol. xxi. New series, vol. v, p. 359.
1823. On the discovery of acids in mineral substances, vol. xxi. New series, vol. v, p. 384.
1823. An improved method of making coffee, vol. xxii. New series, vol. vi, p. 30.
1823. A discovery of chloride of potassium in the earth, vol. xxii. New series, vol. vi, p. 258.
1823. A method of fixing particles on the sappare, vol. xxii. New series, vol. vi, p. 412.
1824. On some compounds of fluorine, vol. xxiii. New series, vol. vii, p. 100.
1824. An examination of some Egyptian colors, vol. xxiii. New series, vol. vii, p. 115.
1824. Some observations on Mr. Penn's theory concerning the formation of the Kirkdale Cave, vol. xxiv. New series, vol. viii, p. 50.

1825. Note to a letter from Dr. Black, describing a very sensible balance, vol. xxvi. New series, vol. x, p. 52.

1825. A method of fixing crayon colors, vol. xxvi. New series, vol. x, p. 236.

Smithson's writings all exhibit clearness of perception, terseness of language and accuracy of expression.*

A trait of Smithson's character is exhibited in the allusions he makes in his writings to other scientific men. His expressions are always kind or complimentary, evidently not for the sake of flattery, but from a sense of justice and truthful recognition of merit. He speaks of Mr. Tennant as one "whose many and highly important discoveries have so greatly contributed to the progress of chemical science." Abbe Haüy he refers to as one "so justly celebrated for his great knowledge in crystallography, mineralogy," &c. "The analysis we possess of natrolite by the illustrious chemist of Berlin," &c.

Of Baron Cronstedt he says, "the greatest mineralogist who has yet appeared."

"A query from the celebrated Mr. Vauquelin."

"The celebrated Mr. Klaproth, to whom nearly every department of chemistry is under numerous and great obligations."

"M. Berzelius' elegant method of detecting phosphoric acid," &c.

"M. Werner, its principal and most distinguished professor," &c.

Smithson died on the 27th of June, 1829, at Genoa, Italy. He was buried in the Protestant cemetery, about a mile west of Genoa, on the high elevation which forms the west side of the harbor and overlooks the town of Sampierdarena. His grave is marked by a handsome monument. The base is of pale gray marble, 6 feet and a half long, 3 feet wide, and 3¾ feet high. On the top of this is a white marble urn suitably proportioned to the base. The lot is inclosed by an iron fence, with gray marble corner posts. On one side of the monument the inscription is as follows:

"Sacred to the memory of James Smithson, esq., Fellow of the Royal Society, London, who died at Genoa the 26th June, 1829, aged 75 years."

On the other side is the following:

"This monument is erected, and the ground on which it stands purchased in perpetuity, by Henry Hungerford, esq., the deceased's nephew, in token of gratitude to a generous benefactor and as a tribute to departed worth."

The announcement of his departure called forth expressions of regret from prominent men of science, and as he had been an honored Fellow of the Royal Society, its president, Sir Davies Gilbert, alluded to it on two occasions. At the meeting of the Royal Society November 30, 1829, he remarked, "In no previous interval of twelve months has the society collectively, or have its individual members, experienced losses so severe, or so much in every respect to be deplored." Among the names then referred to were those of Dr. W. H. Wollaston, Dr. Thomas Young, and Sir Humphrey Davy. To these illustrious savans he adds that of James Smithson, who, he says, "has added eight communications to our Transactions. He was distinguished by the intimate friendship of Mr. Cavendish, and rivalled our most expert chemists in elegant analyses."*

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*A few extracts from his published writings are given in the Appendix, Note 7.

At the following anniversary meeting of the Royal Society, November 30, 1830, the president, Sir Davies Gilbert, delivered an address in which, after speaking of the death of Major Kennele and Mr. Chevenix, he says:

* * * "The only remaining individual who has taken a direct and active part in our labours, by contributing to the Transactions, is Mr. James Lewis Smithson, and of this gentleman I must be allowed to speak with affection. We were at Oxford together, of the same college, and our acquaintance continued to the time of his decease.

"Mr. Smithson, then called Macie, and an undergraduate, had the reputation of excelling all other resident members of the University in the knowledge of chemistry. He was early honored by an intimate acquaintance with Mr. Cavendish; he was admitted into the Royal Society, and soon after presented a paper on the very curious concretion frequently found in the hollow of bambû canes, named *Tabasheer*. This he found to consist almost entirely of silex, existing in a manner similar to what Davy long afterwards discovered in the epidermis of reeds and grasses.

"Mr. Smithson enriched our Transactions with seven other communications: A chemical analysis of some calamines. Account of a discovery of native minium. On the composition and crystallization of certain sulphurets from Huel Boys in Cornwall. On the composition of zeolite. On a substance procured from the elm tree, called *Ulmin*. On a saline substance from Mount Vesuvius. Facts relative to the colouring matter of vegetables.

"He was the friend of Dr. Wollaston, and at the same time his rival in the manipulation and analysis of small quantities. *Αγαθη δ' ερις ἠδε βροτοισι.* Mr. Smithson frequently repeated an occurrence with much pleasure and exultation, as exceeding anything that could be brought into competition with it; and this must apologize for my introducing what might otherwise be deemed an anecdote too light and trifling on such an occasion as the present.

"Mr. Smithson declared that happening to observe a tear gliding down a lady's cheek, he endeavored to catch it on a crystal vessel; that one-half of the drop escaped, but having preserved the other half he submitted it to reagents, and detected what was then called microcosmic salt, with muriate of soda, and, I think, three or four more saline substances, held in solution.

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*_Philosophical Magazine_, 1830, vol. vii, p. 42.

"For many years past Mr. Smithson has resided abroad, principally, I believe, on account of his health; but he carried with him the esteem and regard of various private friends, and of a still larger number of persons who appreciated and admired his acquirements."*

This tribute to his memory and worth shows the high standing Smithson had attained in the estimation of his compeers, and that he secured the fidelity and affection of his dependants is evinced by the care with which, in his will, he provides a reward for their attachment and services.

"It has been the lot of the greatest part of those who have excelled in science," says Dr. Johnson, "to be known only by their own writings, and to have left behind them no remembrance of their domestic life or private transactions, or only such memorials of particular passages as are on certain occasions necessarily recorded in public registers."

To the same effect, Wilson, in his life of Cavendish (the warm friend of Smithson), remarks: "So careless has his own country been of his memory that although he was for some fifty years a well-known and very distinguished Fellow of the Royal Society, a member for a lengthened period of the French Institute, and an object of European interest to men of science, yet scarcely anything can be learned concerning his early history. This, no doubt, is owing in great part to his own dislike of publicity, and to the reserve and love of retirement which strongly characterized him. Long before his death however, he was so conspicuous a person in the scientific circles of London that the incidents of his early life might readily have been ascertained. They were not, it should seem, inquired into by any biographer."†

This is eminently true of Smithson. We are unfortunately debarred from acquiring an intimate knowledge of his personal traits and peculiarities by the absence of an autobiography, or even of any sketch of his life by his friends. For this reason we are more ready to avail ourselves of every fact in regard to him that can be ascertained, however trivial or insignificant any one of these might otherwise be considered. Even an inventory of his wardrobe and a schedule of his personal property possesses an interest and serves at least to gratify a natural curiosity. Such a list has recently been found as certified by the English consul at Genoa, after the death of Smithson, with a valuation of the different articles:

	Francs.
A carriage, complete	2,500 00
Twenty-six silver forks, one salad fork, eight desert spoons, eighteen spoons, four sauce-ladles, one soup ladle, four salt spoons, three sugar ladles, one tea shell, three silver-head corks, two silver vessels, one toasting fork, weighing in all $193\frac{1}{4}$ ounces of silver, valued by Mr. A. Canissa, a goldsmith	1,050 00
An English gold repeater	200 00

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* The *Philosophical Magazine*, January–June, 1831, vol. ix, p. 41.

† George Wilson. *Life of Henry Cavendish.* London, 1851.

	Francs.
A Geneva gold watch	60 00
Two gold snuff-boxes, one toothpick case, and two shirt buttons	417 00
One pin with sixteen small diamonds	33 34
One ring with composition set in diamonds	66 73
One ring of agate	3 40
One ring, cameo, head of a Moor	50 00
Two small boxes, one of tortoise shell, the other of amber	6 30
One gold ring	13 00
One small silver pick case	6 00
A clasp of gold with hair	16 67
A clasp with diamonds	203 34
A pin with hair and diamonds	45 67
A cameo	50 00
A ring with diamonds	92 00
Sixteen shirts, nineteen cravats, forty-four pocket handkerchiefs, thirteen pairs of stockings, three nightcaps, two pair of drawers, two pair of sheets, three pillow-cases, seven waistcoats, two flannel waistcoats, six pair pantaloons, two cloth pantaloons, three coats, one nightgown, one dressing coat, two pair braces, four pair gloves	400 00
One telescope	60 00
Many small articles	100 00
Two pasteboard boxes containing medals, coins, stones, &c.	
One parcel containing papers relative to the Grand Canal*	
Several parcels of papers and five books	
112 Napoleons in gold and 34 francs 60 centimes, in the hands of Messrs. Gibbs & Co	2,274 60
Cash in hands of Messrs. Gibbs & Co	3,634 74
One parcel, thirteen certificates Spanish stock, Paris, 4th September, 1822, 350 piastres rente d'Espagne, par value, francs 24,097 50, valued at	3,780 00
Promissory note for 295 francs, dated 1st June, 1824, due by Alexis Silenne	295 00
Bond for 20,000 francs, dated 8th July, 1828, due by Sailly & Sœur, of Paris	20,000 00
Bill for 2,000 francs, dated 8th October, 1822, drawn by Mr. Sailly, accepted by Mr. Smithson	2,000 00
Bank-note for £100, No. 14419, 19th December, 1827, in the hands of Messrs. Gibbs & Co	2,500 00
Parcel containing accounts and letters from Messrs. Drummond & Co.	

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* The Grand Canal is 90 miles in length, uniting the rivers Trent and Mersey, with branches to the Severn, to Oxford, &c. It was proposed by Mr. Wedgwood, and was the second one made in England.

Very few of these articles were transferred to Mr. Rush, the agent of the United States Government, who received the bequest. His enumeration of the personal effects of Smithson is as follows:

"A large trunk; a box containing sundry specimens of minerals; a brass instrument; a box of minerals; a box of chemical glasses; a packet of minerals; a glass vinegar-cruet; a stone mortar; a pair of silver-plated candlesticks and branches; a pair of silver-plated candlesticks without branches; a hone, in a mahogany case; a plated-wire flower-basket; a plated coffee-pot; a small plated coffee-pot; a pair of wine-coolers; a pair of small candlesticks; two pair salt-cellars; a bread-basket; two pair vegetable dishes and covers; a large round waiter; a large oval waiter; two small oval waiters; two plate-warmers; a reading shade; a gun; a mahogany cabinet; two portraits in oval frames; a china tea-service, consisting of twelve cups and saucers; six coffee-cups; a tea-pot; a slop-basin; a sugar-basin and lid; two plates; a milk-jug; a tea-canister; two dishes; a landscape in a gilt frame; a Derby-spar vase; a China tub; a piece of fluor-spar; a pair of glass candlesticks; a marble bust; sundry books and pamphlets; two large boxes filled with specimens of minerals and manuscript treatises, apparently in the testator's handwriting, on various philosophical subjects, particularly chemistry and mineralogy. Eight cases and one trunk filled with the like."

With reference to a gun, pieces of china, and articles of a miscellaneous nature belonging to Smithson, Mr. Rush was informed by his attorneys that they were taken in possession by his nephew, Henry James Hungerford.

Mr. Rush, in one of his dispatches to the State Department (July 14, 1838), says: "The boxes and trunk are to go on shipboard to-day. Before knowing anything of their contents, I thought proper to have them opened and examined in the presence of our consul and two other persons. A large portion of the contents proved to be unimportant; nevertheless, all will be delivered over on my arrival as I received them, except to have them better packed for a sea voyage, and so as to prevent further injury to that which time and bad packing have already done to them."

These articles remained in the New York custom house from the 29th of August, 1838, until June, 1841, when, at the earnest solicitation of the National Institute of Washington, they were sent to the latter city.

The trunk contained manuscripts and clothing, the latter consisting of the following articles, according to a list found among the papers of the National Institute: "1 net shirt, 4 sheets, 11 napkins, 5 light vests, 1 bag, 4 roundabouts, 5 light pants and short breeches, 1 bib, 3 drawers, 3 pair garters, 2 light coats, 1 cloth overcoat, 1 cloth military coat, 1 cloth hunting coat, 1 cloth cloak, 1 cloth surtout, 1 cloth pair of pants, 2 cloth vests, 4 pair stockings, 1 chapeau."

The clothing was nearly ruined by moths, and was presented to an orphan asylum. An examination of the effects was made by a committee of the National Institute, who made the following report as to part of them: "A cabinet, consisting of a choice and beautiful collection of minerals, comprising probably eight or ten thousand specimens. These, though generally small, are exceedingly perfect, and constitute a very complete geological and mineralogical series, embracing the finest varieties of crystallization, rendered more valuable by accompanying figures and descriptions by Mr. Smithson, and in his own handwriting. The cabinet also contains a valuable suite of meteoric stones, which appear to be specimens of most of the meteorites which had fallen in Europe during several centuries."

Mr. Francis Markoe, jr., himself an expert mineralogist, in a letter to the American Philosophical Society, 4th August, 1841, says "that among the valuable things contained in the Smithson boxes were found a superb collection, and very large, of precious stones and exquisite crystallized minerals, forming, as far as I can judge, decidedly the richest and rarest collection in this country."

A medallion was found among his effects to which were attached the words "my likeness," written in Smithson's own hand. From this has been engraved the portrait published by the Institution, the great seal ordered by the first Board of Regents, and the vignette which appears on all the Smithsonian publications. The original steel-plate portrait, engraved by J. W. Paradise, of New York, in 1847, was destroyed by fire, but it was finely reproduced for the Institution by Charles Burt, of New York, in 1879.

A full-length portrait (about one-fourth size) in oil, of Smithson, representing him in the costume of an Oxford student, was purchased by the Institution in 1850, for thirty guineas, from the widow of John Fitall, a former servant, to whom Smithson granted an annuity in his will.

Still later, in 1878, the Institution purchased from Mr. George Henry De la Batut, of France, a beautiful miniature in oil, on ivory, painted by Johns, on the 11th of May, 1816, at Aix-la-Chapelle.

The effects of Smithson were exhibited in the Patent Office building, Washington, until 1858, when they were transferred to the Smithsonian Institute, where they were unfortunately destroyed by fire on the 24th of January, 1865, with the exception of his books, a very few manuscript notes on minerals, and an oil painting of a landscape. A list of these books now in the Institution will be found in the appendix.*

The following articles are enumerated as the contents of case 23 in Alfred Hunter's "Popular Catalogue of the Extraordinary Curiosities in the National Institute, arranged in the building belonging to the Patent Office," 1855:

"Silver plate with coat of arms of the Northumberland family; chemical apparatus, test-cups, &c; thermometer, snuff-box, portrait of

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* See Appendix—Note 8.

Smithson's father, scales, umbrella-case, and riding-whip, sword-belt and plume, silver spoons and butter-knife, ornamented spools for winding gold wire, copper plate with his name engraved on it; minerals of Smithson, a very superb collection, though small; silver candlestick; an elegant service of silver, containing a great many pieces. These are all very much discolored by sulphurous gas. A marble head of Saint Cecilia, by Thorwaldsen, presented to Mr. Smithson at Copenhagen by Dr. Brandis, physician to the King of Denmark. A fine old original painting by Bergham, cattle piece, peasants, &c.; an old building in the distance. Its subject is rustic and familiar life. The treatment is chaste and mellow. The depth of the foreground is really surprising, and appears to be produced without an effort; the background is transparent and aerial; the middle distance sober and clear; the atmosphere and vapors pellucid and tremulous; the quiet and docile animals, the groups of peasantry, and the strongholds of power are equal to any other great effort of the celebrated Bergham. Many specimens of petrified wood. Notice several beautiful specimens of marble, which it would be difficult to distinguish from a fine landscape painting. Glass model of the great Russian diamond, valued at about 600,000 pounds sterling."

In an "Account of the Smithsonian Institution, &c.," by Wm. J. Rhees, published in Washington in 1859, the following statement is made:

"In the room used by the 'Regents' and the 'Establishment' as a hall for their meetings, are now deposited the personal effects of James Smithson. Here may be seen his trunks, umbrella, walking-cane, sword, plume, riding-whip; a set of silver-plate; a miniature chemical laboratory, which he used when travelling; thermometers, snuff-box, scales, candlesticks, &c. Hanging in this room is an original painting by Bergham, a rural scene, the property of Smithson, a marble head of St. Cecilia, by Thorwalsden, &c."

The will of Smithson was prepared by him on the 23d October, 1826, while residing in Bentinck street, Cavendish Square, London, three years before his death, showing that it was made with deliberation and confirmed by mature reflection. Its provisions are in some respects so remarkable that they have been attributed to a mere whim or eccentricity of character; but knowledge of the man as a scientific investigator, accustomed to the use of precise language, fond of the most minute details, and yet of broad and comprehensive views, precludes this inference. An interesting circumstance has come to light from a recent careful examination of the books in Smithson's library. A volume has been found entitled "Plain advice to the public, to facilitate the making of their own wills, with forms of wills, simple and elaborate, containing almost every description of bequest, especially the various modes of settling property for the sole use and benefit of married women for their lives, with powers of appointment to them by deed or will; tables of the stamp duties on probates and letters of administration; special rules and tables regarding the wills and letters of administration of petty officers, seamen, and marines, and a chapter of useful hints to persons about to make their own wills; the whole illustrated with explanatory notes and remarks, being an intelligible and complete, though summary, explanation of the law of wills and testaments.' By the author of 'Plain instructions to executors and administrators.'" London, 1826, 8vo., 94 pages.

It is noticeable that this book was published in the same year in which Smithson made his will, and that it was carefully studied is evident from his marginal notes, and the fact that he adopted its phraseology in providing an annuity to his faithful servant. His words were not only chosen to accord with the forms of law, but with strict regard to the meaning and scope of the language used. The will, moreover, is in the testator's own handwriting.

It is an interesting subject of speculation to consider the motives which actuated Smithson in bequeathing his fortune to the United States of America to found an institution in the city of Washington.

He is not known to have had a single correspondent in America, and in none of his papers is found any reference to it or to its distinguished men.* It has been alleged that he was more friendly to monarchical than to republican institutions, but there appears to be no foundation for this opinion. It is more probable that, living at a time when all Europe was convulsed with war, when the energies of nations, the thoughts of rulers, and the lives of millions were devoted to efforts for conquest or to perpetuate despotism, he turned to the free American Republic, where he could discern the germs of rising grandeur, the elements of enduring prosperity, and the aspirations of coming generations. He undoubtedly felt that in the United States there would be wider scope for the promotion of knowledge, and that in this new country there would always be free thought and indefinite progress. By selecting the nation itself as the depository of his trust he paid the highest compliment to its intelligence and integrity, and testified his confidence in republican institutions and his faith in their perpetuity.

The period in which Smithson lived was not less marked by the gloom occasioned by long-protracted and almost universal war, and the extent and rapidity of its social changes, than by the luster of its brilliant discoveries in science and its useful inventions in the arts. The leaders of contending nations, who had long absorbed the attention of Europe by their struggles for dominion, were at last forced to relinquish some of their honors to the great philosophers whose achievements then illuminated the page of history, and which have not since been surpassed. It was pre-eminently a period of activity of thought, of fertility of invention and of original research. Pure abstract science had many illustrious votaries, and the practical application of its truths gave to the world many of the great inventions by means of which civilization has made such immense and rapid progress.

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* There are only two books in Smithson's library containing references to the United States. Extracts from these relative to the city of Washington are given in the Appendix, Note 9.

Not only were individual efforts for the welfare of humanity made, but a spirit of association was developed and numerous organizations formed, having for their object the promotion of science, education, and philanthropy. The few existing societies also became inspired with new life and vigor. The "Royal Society of London" entered upon its most brilliant epoch and became the fountain and center of intellectual progress. "The Royal Institution of Great Britain," chiefly indebted for its origin to an American, was founded in 1800, "for diffusing the knowledge and facilitating the general introduction of useful mechanical inventions and improvements and for teaching by courses of philosophical lectures and experiments the application of science to the common purposes of life." A glance at the names of a few of the great organizations instituted in different parts of the world at the close of the last and beginning of the present century will show the remarkable scientific activity of that period and the direction of thought towards the establishment of permanent institutions:

1782. Royal Irish Academy.
1784. Royal Asiatic Society.
1788. Linnean Society.
1788. Société Philomatique.
1795. Société Philotechnique.
1799. Academy of Sciences, Lisbon.
1800. Royal Institution of Great Britain.
1805. Société Anthropologique, Paris.
1807. Geological Society of London.
1808. Royal Institute of the Low Countries.
1812. Literary and Philosophical Society, Liverpool.
1812. Royal Academy of Sciences of Berlin (reorganized).
1816. The French Academy of Sciences (reorganized).
1818. Academy of Natural Sciences, Philadelphia.
1819. Philosophical Society, Cambridge.
1820. Royal Astronomical Society.
1821. Société Impériale de Géographie, Paris.
1822. Société Asiatique, Paris.
1825. Société Royale des Antiquaires du Nord, Copenhagen.
1826. Zoölogical Society, London.

The remarkable advances made in science at this epoch were thus alluded to by Arago in his eulogy on Thomas Young:

"In a short space of time the Academy has lost from the list of its members, Herschel, whose bold ideas on the structure of the universe have acquired every year more of probability; Piazzi, who, on the first day of the present century, presented our solar system with a new planet; Watt, who, if not the inventor of the steam-engine, was at least the creator of so many admirable contrivances by the aid of which the little instrument of Papin has become the most ingenious, the most useful, the most powerful means of applying industry; Volta, who has been immortalized by his electric pile; Davy, equally celebrated for the decomposition of the alkalies, and for the invaluable safety-lamp of the miner; Wollaston, whom the English called "the Pope," because he never proved fallible in any of his numerous experiments or of his subtle theoretical speculations; Jenner, lastly, whose discovery I have no need to extol in the presence of fathers of families."

Cuvier also made the following imposing retrospect of the scientific achievements of this era in his eulogy on Haüy:

"The laws of a geometry, as concise as comprehensive, extended over the entire heavens; the boundaries of the universe enlarged and its spaces peopled with unknown stars; the courses of celestial bodies determined more rigorously than ever, both in time and space; the earth weighed as in a balance; man soaring to the clouds or traversing the seas without the aid of winds; the intricate mysteries of chemistry referred to certain clear and simple facts; the list of natural existences increased tenfold in every species, and their relations irrevocably fixed by a survey as well of their internal as external structure; the history of the earth, even in ages the most remote, explored by means of its own monuments, and shown to be not less wonderful in fact than it might have appeared to the wildest fancy: such is the grand and unparalleled spectacle which it has been our privilege to contemplate."

While scientific thought and discovery were thus being advanced, attention was directed to the great ignorance of the masses. The idea of universal diffusion of knowledge had been unknown in England, and many of the upper classes of society cherished and avowed a deeply rooted dislike to the education of the poor, as "tending to discontent and an overthrow of that orderly subordination without which society cannot exist." The principle was held by many, and considered indisputable, that "the ignorance of the people was necessary to their obedience to law."*

The period, however, was one in which revolution was commencing in all directions. Many of the old landmarks of thought, opinion, and fact were in process of removal and new ones were rapidly becoming established. The progress and results of mechanical invention were producing great social changes. Lord Brougham's "Treatise on Popular Education," first published in January, 1825, had reached its twentieth edition in the following year. His vigorous, eloquent, and practical appeals to his countrymen were exciting universal attention, and through his efforts the first of the useful and popular Mechanics' Institutes was established, the University of London was founded, and book clubs, reading societies, and scientific lectures were organized.

At the opening of the session of Parliament in 1828, he proclaimed that it was unconstitutional that almost the whole patronage of the State should be placed in the hands of a military premier. The concluding passage of his speech ran through the country, and dwelt forever in men's minds in its axiomatic power. "There had been periods when the country heard with dismay that the soldier was abroad. That is not the case now. Let the soldier be ever so much abroad, in the present age he could do nothing. There is another person abroad—a less important person, in the eyes of some an insignificant person, whose labours have tended to produce this state of things—*the schoolmaster is abroad.*"[*]

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* Lord Cockburn.

Lord Brougham had declared that "to instruct the people in the rudiments of philosophy would of itself be an object sufficiently brilliant to allure the noblest ambition. To promote these ends and to obtain for the great body of his fellow-creatures that high improvement which both their understanding and their morals fitted them to receive," he urged upon the consideration of the men of wealth of Britain. "Such a one, however averse by taste or habit to the turmoil of public affairs, or the more ordinary strifes of the world, may in all quiet and innocence enjoy the noblest gratification of which the most aspiring nature is susceptible; he may influence by his single exertions the character and the fortunes of a whole generation, and thus wield a power to be envied even by vulgar ambition, for the extent of its dominion; to be cherished by virtue itself, for the unalloyed blessings it bestows." He pressed the subject on the attention "of all men of enlightened views, who value the real improvement of their fellow-creatures and the best interests of their country." He appealed to public-spirited individuals to promote the diffusion of knowledge and the cultivation of intellectual pursuits by devoting some of their means to these objects, and showed how much money had been misapplied by benevolent persons in sustaining certain charitable institutions which only tended to increase the number of the poor and dependent classes.

The "Society for the Diffusion of Useful Knowledge" was established in April, 1825, and at once entered upon a career alike brilliant and successful. "Its publications," says the Edinburgh Review,[†] "undoubtedly form by far the most important of the contributions from men of science and letters to the instruction and improvement of mankind." "Its efforts were to be extended until knowledge had become as plentiful and as universally diffused as the air we breathe."

It cannot be doubted that Mr. Smithson became impressed with the prevailing and new spirit of his age, and, recognizing as a man of science the inestimable value of knowledge and the importance of its universal diffusion, wrote the words of his will bequeathing his whole fortune "*for the increase and diffusion of knowledge among men.*"

At one period of his life, and when an active member of the Royal Society, he purposed leaving his fortune to that body for the promotion of science,* but it is said that a disagreement with the council of the society on account of the non-acceptance of one of his papers probably led him to abandon the idea. This circumstance is of importance as indicating the bent of his mind and the mode in which he proposed to benefit mankind. The difficulty referred to, however, undoubtedly led him to give broader scope to his plan, and to choose a trustee for his endowment who would be hampered by no conventional or traditional restrictions, and who would understand and carry out his purposes in the most liberal and practical manner.†

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[*] Chas. Knight's *Passages of a Working Life.* London, Vol 2, p. 66.

[†] *Edinburgh Review,* Vol. xlvi, 1827, p. 243.

It is peculiarly gratifying to Americans to remember that the *first* award made by the Council of the Royal Society of the Copley medal, the most honorable within its gift, was to our own countryman, Benjamin Franklin, who was adjudged to be the author of the most important scientific discovery. On this occasion the president of the society stated that the council, "keeping steadily in view the advancement of science and useful knowledge, and the honor of the society, had never thought of confining the benefaction within the narrow limits of any particular country, much less of the society itself."

As this was the spirit of the leading scientific organization in existence, of which Smithson himself was an active and honored member, he well exemplified its liberal principles by transferring his foundation of a great establishment for the "increase and diffusion of knowledge among men" from London to the city of Washington.

Smithson received a large estate from his half brother, Colonel Henry Louis Dickinson, in trust for the benefit of the son of this brother as well as of his mother. To this nephew, to whom he was probably attached, or because he had derived a large part of his fortune from his father, he left his whole fortune. Contingent on the death of this young man, he made the remarkable provision of an establishment in the United States which has secured for him the distinction of being a *benefactor of mankind.*

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* The charter states that the Royal Society was founded for the improvement of *natural knowledge.* This epithet *natural*, Dr. Paris remarks, "was intended to imply a meaning of which very few persons are aware. At the period of the establishment of the society the arts of witchcraft and divinations were very extensively encouraged, and the word natural was therefore introduced in contradistinction to *supernatural.*" Hooke, the president, declared, in 1663, that "the business and design of the Royal Society was to improve the knowledge of natural things, and all useful arts, manufactures, mechanick practises, engynes and inventions by experiments—(not meddling with divinity, metaphysics, moralls, politicks, grammar, rhetorick, or logick.)"

Dr. Wollaston had made a gift of £1,000 to the Royal Society, the interest of which was to be annually applied towards the encouragement of experiments.

† "Our countrymen do not believe that America is more advanced in knowledge and refinement than Europe; but they know that, with slight divergencies, both hemispheres are in this respect nearly abreast of each other. And they know that, both being yet far from the goal, their generous transatlantic rivals start unencumbered by many old prejudices and social trammels which we cannot here escape from."—(Tait's *Edinburgh Magazine,* 1832, p. 234.)

It has been shown with what zeal and pleasure Smithson himself engaged in the advancement of knowledge, and what general interest had been awakened in England in the cause of scientific organization and popular education at the very time he wrote his will, and it is not unreasonable, therefore, to believe that he contemplated this contingency as a very probable event.

The will of Smithson, dated October 23, 1826, was proved in the Prerogative Court of Canterbury by his executor, Mr. Charles Drummond, a London banker, on the 4th of November, 1829. The value of the effects was sworn to be under £120,000.*

In 1878, a copy of a will also in Smithson's handwriting was procured by the Institution from Mr. de la Batut, almost identical with the one recorded in the courts of London.

It appears from this that the word heretofore printed *Audley* in copies of the will should be "Studley," and that the name of the former servant who kept the Hungerford Hotel at Paris should be Sailly, and not Jailly. In the record of the will at London, the word Smithsonian as the name of the Institution to be established is "Smithsonean," but as it is very plainly written "ian" in what we must consider his original draft, the misspelling referred to is undoubtedly due to an error of the transcriber. In all the proceedings in the court of chancery, and all the negotiations of Mr. Rush, the name "Smithsonian" has uniformly been used.

The first article of the will refers to an old and trusted servant, John Fitall, to whom, in consideration of his attachment and fidelity, Smithson bequeaths an annuity of a hundred pounds sterling. This Fitall died in June, 1834, having enjoyed the benefit of his legacy for five years.

Mr. Smithson next directs that various sums of money he had lent to another of his servants, Henri Honori Sailly, should be allowed to remain uncalled for at five per cent. interest for five years.

He then mentions the fact that all the money in the French five per cents. (*livres de rentes*) then standing in his own name and in that of Colonel Dickinson was the property of his nephew, being what he inherited from the colonel, who died on the 22d May, 1820, with what he had added himself to it from savings made out of the income. To this nephew, Henry James Hungerford, who was also known as Henry James Dickinson, and still later as Baron Eunice de la Batut, he leaves the rest of the income arising from his property during his life. The whole of his fortune is by the next clause of the will left absolutely and forever to any child or children, legitimate or illegitimate, of the said nephew Hungerford. But in case of the death of his nephew without leaving a child or children, or of the death of the child or children he may have had under the age of twenty-one years or intestate, he then says:

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* *Gentleman's Magazine*, 1830, vol. c., p. 275.

"I bequeath the whole of my property to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

The nephew, Mr. Hungerford (alias H. J. Dickinson), to whom was bequeathed a life interest in Smithson's estate, brought an amicable suit in chancery against the executors for the purpose of having the assets administered under the direction of the lord chancellor, and these were ascertained to be about £100,000 sterling. The income from this property, which consisted mainly of stock in the public funds of England, was promptly paid to young Hungerford, who led a roving life in Europe, without settled habits or occupation, and died under the name of Baron Eunice de la Batut, at the Royal Hotel in Pisa, Italy, on the 5th of June, 1835, under thirty years of age, never having married, and leaving no heirs who could, even under the broad provisions of his uncle's will, make a claim to his bounty.

The mother of Hungerford, a Mrs. Mary Ann Coates, had married a Frenchman named Theodore de la Batut, and was still living at Port Louis in France. She now made a claim for part of the estate, on the ground that her son had given her an ample allowance while he lived, and that under the will of his father, Col. Henry Louis Dickinson, made in Paris in July 1819, by which he left all his property to his brother, James Smithson, half the income was to be for her benefit during her life. It was shown that young Hungerford lived up to his income, and had left nothing even to pay debts or funeral expenses. It was also urged that if Smithson's will had come into operation then, instead of seven years before, Hungerford would, in consequence of an alteration of the law, have been entitled to a portion of the accruing half-year's income up to his death; and that, in consequence of the change in the law, he could not be said to have enjoyed the income of the property during his whole life. It was also urged as a "moral claim," that as the Smithson bequest was to be applied "to increase and diffuse knowledge among men," the children of Mrs. de la Batut were entitled to an allowance from it until the age of twenty-two for their education.

The claim made was for an annuity of £240; but after long negotiation the decree was made by the court of chancery to allow Mrs. de la Batut £150 9*s*. during her life, with a payment of £526 11*s*. 6*d*. for arrears from the 22d September, 1834, to the 22d March, 1838. To secure this annuity, the sum of £5,015 in three per cent. consols was retained in trust by the court, the interest to be paid on the 22d September and 22d March annually. By the law of France, the life income is apportionable and payable up to the time of death; and Colonel Dickinson having been domiciled in France, this rule applied in his case.

Mrs. de la Batut lived to the year 1861, and the amount retained in England as the principal of the annuity was paid over to the Institution on the 11th June, 1864. This is known as the "residuary legacy" of Smithson, and the sum realized from it by the Institution, by the premium on gold, &c., was $54,165.38.

The first announcement made to the American Government of the fact that the United States had become entitled to the bequest of Smithson was a dispatch, dated 28th July, 1835, from Hon. Aaron Vail, chargé d'affaires of the United States at London, to Hon John Forsyth, Secretary of State, transmitting a letter from Messrs. Clarke, Fynmore and Fladgate, attorneys in that city. This communicated the intelligence that the nephew of Smithson had died, and that the United States was entitled to the estate, valued at £100,000.

These facts were laid before Congress by President Jackson on the 17th December, 1835, who stated in his message that he had no authority to take any steps toward accepting the trust.

In the Senate of the United States the message of the President was referred to the Committee on the Judiciary, which, by its chairman, Mr. Benj. Watkins Leigh, of Virginia, reported, on the 5th of January, 1836, that they considered the bequest of Mr. Smithson a valid one, and they believed "that the United States would be entertained in the court of chancery of England to assert their claim to the fund as trustees for the purpose of founding the charitable institution at Washington to which it is destined by the donor." The question whether it was within the competency of the Government to appropriate any part of the general revenue from the nation at large to the foundation of a literary or any other institution in the District of Columbia was answered by Mr. Leigh by stating that—

"The fund given by Mr. Smithson's will is nowise, and never can become, part of the revenue of the United States; they cannot claim or take it for their own benefit; they can only take it as trustee."

"The United States were to be regarded as the *parens patriæ* of the District of Columbia, and in that character they had a right and were in duty bound to assert a claim to any property given to them for the purpose of founding an institution within the District, and to provide for the due application and administration of such a fund when they obtained possession of it."

Resolutions were reported by the committee providing for the prosecution of the claim. The report was considered in the Senate on the 30th April, 1836, and it was urged by Mr. W. C. Preston, of South Carolina, that the Government of the United States had no power to receive the money. He thought the donation had been made partly with a view to immortalize the donor, and it was "too cheap a way of conferring immortality." He had no idea of the District of Columbia being used as a fulcrum to raise foreigners to immortality by getting Congress as the *parens patriæ* to accept donations from them. He expressed the opinion that Smithson's intention was to found a university.

Mr. Leigh, in reply, maintained that the legacy was not for the benefit of the United States, but only for one of the cities of the District of Columbia, and with this belief he had no difficulty in voting for the bill.

Mr. John M. Clayton, of Delaware, also thought a university was intended by Smithson.

Mr. John C. Calhoun, of South Carolina, was of opinion that the donation was made expressly to the United States, and that "it was beneath their dignity to receive presents of this kind from any one."

Mr. Samuel L. Southard, of New Jersey, advocated the measure, as he thought Congress had the unquestionable right to establish a national university.

Mr. James Buchanan, of Pennsylvania, believed that Congress had the power to receive and apply this money to the purposes intended by the testator, without involving the question whether it was for a university or not.

Mr. Robert J. Walker, of Mississippi, advocated the bill as a measure of justice to the city of Washington.

Mr. John Davis, of Massachusetts, argued that the Senators were mistaken who assumed that Smithson intended his bequest to establish a university. This word was not to be found in the will, and there were other means for diffusing knowledge besides the one referred to. He deemed the establishment of institutions for the promotion of knowledge a vital principle of republican government.

After a somewhat protracted debate the resolutions were finally passed on the 2d of May, 1836, by a vote of 31 to 7, and on the 25th of June they were again passed in the shape of a bill as it had come from the House of Representatives.

The message of the President was referred in the House, on the 21st of December, 1835, to a special committee, consisting of Mr. John Quincy Adams, of Massachusetts, Mr. Francis Thomas, of Maryland, Mr. James Garland, of Virginia, Mr. D. J. Pearce, of Rhode Island, Mr. Jesse Speight, of North Carolina, Mr. Thomas M. T. McKennan, of Pennsylvania, Mr. E. A. Hannegan, of Indiana, Mr. Rice Garland, of Louisiana, and Mr. G. H. Chapin, of New York. In this committee great opposition was manifested at first to the acceptance of the bequest, but this yielded to the arguments and persuasion of the distinguished chairman, Mr. John Q. Adams. A bill was accordingly reported, directing the President to appoint an agent to assert and prosecute for and in behalf of the United States in the court of chancery, England, the legacy bequeathed by James Smithson. The agent was to give bonds in $500,000 for the faithful performance of the duties imposed upon him. The Treasurer of the United States was to take charge of and keep safely all the money received on account of the bequest, and "the faith of the United States was solemnly pledged that the fund should be applied for the purpose of founding and endowing at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." For the cost of prosecuting the claim an appropriation of $10,000 was made.

On the 19th of January, 1836, Mr. Adams made an elaborate report, containing all the facts he had been able to collect relative to Smithson, and expressing in the most glowing and refined language his appreciation of the value of the gift to America and its importance to mankind. Mr. Leigh had convinced the Senate that it was the duty of Congress to accept the bequest, and Mr. Adams brought before the House an account of the life of the testator, the nature of the trust, the character of the trustees, the practical influence of our political institutions upon Europe, and the vast benefits to the world which might grow out of the legacy. The report was unanimously agreed to in the committee, but Mr. Adams had great misgivings whether anything would ever be realized from the bequest. The delays of the English court of chancery were well known, and the opinion had even been expressed that the whole affair was an imposture. Mr. Adams never wavered, however, in his faith in the power of the government to procure the money and its ability to administer it properly. He refers in his diary to it as the favorite and almost absorbing subject of his thoughts, and for many years he devoted untiring activity and personal efforts to its successful accomplishment.

No action was taken by the House on Mr. Adams's report until the Senate had passed Mr. Leigh's resolution; when that was taken up, changed in form to that of a bill, passed on the 25th of June, 1836, and was approved by the President on the 1st of July, 1836.

In accordance with this act the President appointed, on the 11th of July, Hon. Richard Rush, of Pennsylvania, as the agent to assert and prosecute the claim of the United States to the legacy. His salary was fixed at $3,000 per annum, and $2,000 were allowed for contingencies, not including legal expenses. Mr. Rush gave the necessary bond for $500,000, Messrs. J. Mason, jr., and Benjamin C. Howard being his sureties, who were accepted by Mr. Woodbury, Secretary of the Treasury. This appointment was one eminently fit to be made, and its wisdom was proved by the successful accomplishment of the mission. Mr. Rush had been Comptroller of the United States Treasury at a time when the fiscal affairs of the government were in disorder; he was next Attorney-General; then minister to England for a period of eight years; Secretary of the Treasury; and minister to France. "To these great and varied employments," Hon. J. A. Pearce has remarked, "he brought integrity, ability, intelligence, firmness, courtesy, and a directness of purpose which scorned all *finesse* and which served his country to the full extent of all that could have been demanded or hoped."

Mr. Rush immediately proceeded to London, placed himself in communication with the attorneys of the executor of Smithson, and entered with vigor into the measures necessary to assert the claim of the United

States. It was soon ascertained, on consultation with eminent counsel, Messrs. Thomas Pemberton and Edward Jacob, then at the head of the chancery bar, that it was necessary that a suit should be brought in the name of the President of the United States against the testator's executors, and that the Attorney-General must be made a party to the proceedings in order that he might represent before the court any claim which the Crown might have to the bequest on account of its extension to illegitimate children, or by reason of any part of the property consisting of interests in land. Mr. Rush, in addition to Messrs. Pemberton and Jacob, employed Messrs. Clarke, Fynmore, and Fladgate as his legal advisers, and a suit was commenced in the court of chancery in November, 1836. The first hearing, however, did not take place until the 1st of February, 1837, before Lord Langdale, master of the rolls, this court and that of the vice-chancellor being the two branches of the English chancery system before which suits are brought in the first instance.

The case was fully opened on behalf of the United States by Mr. Pemberton. The King's counsel abandoned at once all opposition on the part of the Crown, and no question was raised under the doctrine of escheats or any other by the representatives of the British Government. The court then decreed that the case be referred to one of the masters in chancery, Mr. Nassau William, Sen., to make the requisite inquiries as to the facts on the happening of which the United States became entitled to the fund left by Mr. Smithson, and also as to the claim of Madame De la Batut.

The United States had never before sued in an English court, but there were precedents of other nations having done so by their executive heads, as, for example, the King of France and the King of Denmark. The United States were therefore allowed to enter the courts in the name of the President.

Advertisements were immediately inserted in the London Times, Herald, and Standard, and in French and Italian newspapers in Paris and Port Louis, in France, and Leghorn, in Italy, asking for information respecting Henry James Hungerford; whether he married, whether he left any child, &c.

Mr. Rush, in August, 1837, wrote to the Secretary of State that there were more than eight hundred cases in arrears in the court of chancery, and he felt much discouraged as to a speedy termination of the suit. While the population of England had increased in a definite period sixfold and her wealth twentyfold, the judicial establishment had remained nearly the same. There were only eleven masters in chancery, while double the number would not be sufficient. The subject of a reform in this court, Mr. Rush stated, had been specially recommended by the Throne to Parliament. It had been said, with truth, that "a chancery suit was a thing that might begin with a man's life and its termination be his epitaph." Still later it will be remembered that Mr. Dickens stated in 1853 that there was then "a suit before the court of chancery which had been commenced twenty years before in which from thirty to forty counsel had been known to appear at one time, in which costs had been incurred to the amount of £70,000, which was a *friendly* suit, and which was no nearer its termination than when it was begun."

Mr. Rush refers in terms of high compliment to the solicitors he had employed on behalf of the United States. He says:

"That more attention, diligence, discretion, and integrity could not have been exerted by any persons than they have shown throughout the whole suit from first to last. Could they ever have forgotten what was due to the United States and to themselves, in the desire to eke out a job, nothing is plainer to me, from what has been passing under my observation of the entanglements and delays natural to a heavy suit in the English court of chancery, than that they might have found opportunities in abundance of making the suit last for years yet to come."

It is therefore to be regarded as one of the most remarkable events in the history of the bequest that the suit of the United States, commenced in November, 1836, should have been brought to a successful issue, in less than two years, on the 12th of May, 1838, which, it may be interesting to note, was the first year of the reign of Her Majesty Queen Victoria.

Mr. Rush was therefore placed in possession of the legacy with the exception of the part reserved as the principal of an annuity to Madame De la Batut. Mr. Rush thus expresses his satisfaction at the result:

"A suit of higher interest and dignity has rarely perhaps been before the tribunals of a nation. If the trust created by the testator's will be successfully carried into effect by the enlightened legislation of Congress benefits may flow to the United States and to the human family not easy to be estimated, because operating silently and gradually throughout time, yet operating not the less effectually."

Scarcely had the decision of the court been made and the amount of the award published in the newspapers, when two claimants for the estate of Smithson appeared, neither having any connection with the other; and they desired, rather importunately, to know if the case could not be reopened. They were much chagrined to find that they were a little too late in their application, and nothing more was heard of them.

The American minister to England, Mr. Stevenson, and our consul at London, Mr. Aspinwall, united in testifying to the great tact and ability of Mr. Rush, and in affirming—

"That no litigant ever displayed a more ardent zeal or a more sagacious, devoted, and unremitting diligence in the prosecution of his private suit than *he* did in urging on this public one to a prompt and successful conclusion. The dispatch with which in consequence this purpose was finally accomplished is almost without example in the annals of chancery. His solicitors will long remember his adroit and unsparing application of the spur. Had he not urged them to the top of their speed, he would have had a lighter weight of gold to carry home with him."

The estate of Smithson which was transferred to Mr. Richard Rush consisted of the following securities:

£64,535 18*s.* 9*d.* in consolidated three per cent. annuities, called consols, sold at an average of 95⅜ per cent., yielded £56,175.

£12,000 in reduced three per cent. annuities, sold at 94 per cent., yielded £11,280.

£16,100 in Bank of England stock, sold at about 205 per cent., yielding £32,996 10*s.*

Good-fortune again attended Mr. Rush, for the day when he sold the consols their value was higher than at any previous time for many years or than at any later period. The bank stock also commanded the remarkably high premium of about 205 per cent.

The estate, therefore, independent of the accumulations of interest and notwithstanding the delays in the court of chancery, was worth more than in the summer of 1835, when the right of the United States first attached to it by the death of Henry James Hungerford, and the entire amount of sales yielded an aggregate of more than one hundred and six thousand pounds sterling.

Mr. Rush's next concern was how to transfer these funds to the United States, and he decided to convert the whole into gold coin and send it in this form. This was not only the most judicious course, but it secured an increase of the fund to upwards of a thousand pounds sterling on account of saving the cost of exchange. This sum was enough to cover commissions, insurance, freight, and other charges on the transfer of the gold.

The costs of the suit and expenses connected with the shipment of the proceeds of the bequest were as follows:

Costs of the chancery suit, £490 4*s.* 10*d.*; selling the stock, commission to Thomas Aspinwall, £797 15*s.* 6*d.*; charges for shipping, £6 19*s.* 4*d.*; premium of insurance, £605 3*s.* 10*d.*; brokerage, stamps, &c., £120 4*s.* 6*d.*; freight from London to New York, £393 12*s.*; primage, £19 13*s.* 8*d.*

The proceeds of the sales of the stocks, &c., were converted into gold sovereigns, and these were packed at the Bank of England in bags containing £1,000 each and shipped in eleven boxes by the packet Mediator, of New York, on the 17th July, 1838. Three other boxes sent at the same time contained the personal effects of Smithson.

The ship *Mediator* arrived in New York on the 29th of August, 1838, and the gold, amounting to £104,960 8*s.* 6*d.*, was deposited in the Bank of America until the 1st of September, when it was delivered to the Treasurer of the United States Mint in Philadelphia, and immediately recoined into American money, producing $508,318.46 as the bequest of Smithson.

LEGISLATION OF CONGRESS

IN RELATION TO

THE DISPOSITION OF THE BEQUEST.

On the 6th of December, 1838, President Van Buren had the satisfaction of announcing to Congress that the claim of the United States to the legacy bequeathed to them by James Smithson had been fully established, and that the fund had been received by the government. He now urged the prompt adoption of a plan by which the intentions of the testator might be fully realized. For the purpose of obtaining information which might facilitate the attainment of this object, he applied, through the Secretary of State, to a number of persons "versed in science and familiar with the subject of public education, for their views as to the mode of disposing of the fund best calculated to meet the intentions of Smithson, and be most beneficial to mankind."

He communicated to Congress the replies received, of which the following is a brief abstract.

President Francis Wayland, of Brown University, proposed a university of high grade to teach Latin, Greek, Hebrew, Oriental languages, and a long list of other branches, including rhetoric, poetry, intellectual philosophy, the law of nations, &c.

Dr. Thomas Cooper, of South Carolina, also proposed a university, to be opened only to graduates of other colleges, where the higher branches of mathematics, astronomy, chemistry, &c., should be taught, but Latin and Greek, literature, medicine, and law excluded.

Mr. Richard Rush proposed a building, with grounds attached, sufficient to reproduce seeds and plants for distribution; a press to print lectures, &c.; courses of lectures on the leading branches of physical and moral science, and on government and public law; the salaries to be ample enough to command the best men, and admit of the exclusive devotion of their time to the studies and investigations of their posts; the lectures, when delivered, to be the property of the institution for publication. Mr. Rush also made the excellent suggestion that consuls and other United States officers might greatly aid the institution by collecting and sending home useful information and valuable specimens from abroad.

Hon. John Quincy Adams expressed, in his reply, the opinion that no part of the fund should be devoted "to the endowment of any school, college, university, or ecclesiastical establishment"; and he proposed to employ seven years' income of the fund in the establishment of an astronomical observatory, with instruments and a small library.

The subject of the Smithson bequest was referred in the House of Representatives on the 10th December, 1838, to a special committee of nine members, of which Hon. John Quincy Adams was chairman. Besides the letters transmitted to Congress by President Van Buren, other plans were brought before the committee.

A memorial from Prof. Walter R. Johnson suggested the establishment of an institution for experiment and research in physical science especially pertaining to the useful arts, and the discovery, description, application, and improvement of the natural resources of our country. Another scheme was presented by Mr. Charles L. Fleischmann for the establishment of an agricultural school and farm, and he entered into the most minute detail as to the buildings and estimates for all the parts of the plan. There were also propositions to use the fund "for the instruction of females," for the establishment of "professorships," for "courses of lectures," for "improved methods of rearing sheep, horses, and silkworms," for founding a great library, &c.

Mr. Adams very earnestly opposed the appropriation of any part of the fund to educational purposes, believing that it was the duty of the country itself to provide the means for this important object. His own favorite scheme was the establishment of an astronomical observatory, and this he advocated in the most ardent, able, and persistent manner.

The chairman of the Senate committee, Hon. Asher Robbins, of Rhode Island, proposed the creation of "an institution of which there is no model either in this country or in Europe, to provide such a course of education and discipline as would give to the faculties of the human mind an improvement far beyond what they obtain by the ordinary systems of education and far beyond what they afterwards attain in any of the professional pursuits." His speech in the Senate on the 10th of January, 1839, in presenting his views on this subject is remarkable for its beauty of diction, elevation of sentiment, and classical erudition.

Mr. Robbins's resolutions provided for a scientific and literary institution, and stated that to apply the fund to the erection and support of an observatory "would not be to fulfil *bona fide* the intention of the testator, nor would it comport with the dignity of the United States to owe such an establishment to foreign eleemosynary means."

The plan of Mr. Robbins was not received with sufficient favor in the Senate to secure its passage, and it was laid on the table by a vote of 20 to 15, on the 25th of February, 1839. Among those who favored the bill were Senators Clay, Davis, Prentiss, Preston, Rives, and Walker, and among those opposed to it were Senators Allen, Bayard, Benton, and Calhoun.

Mr. Adams remarks in his diary, October 26, 1839, that his mind was "filled with anxiety and apprehension lest the fund should be squandered upon cormorants or wasted in electioneering bribery." He adds:

"It is hard to toil through life for a great purpose with a conviction that it will be in vain, but possibly seed now sown may bring forth some good fruit hereafter. If I cannot prevent the disgrace of the country by the failure of the testator's intention, I can leave a record of what I have done and what I would have done to accomplish the great design if executed well."

At the beginning of the Twenty-sixth Congress, December, 1839, Mr. Adams again brought up the subject of the Smithson bequest and had it referred to a committee of nine, consisting of Messrs. Adams, Ogle, Shepard, Garland of Virginia, Lewis, Albert Smith, Barnard, Corwin, and Campbell of South Carolina.

A memorial was presented to Congress from the Corporation of the city of Washington, expressing great anxiety "to see the instructions of Smithson carried into effect, believing it impossible to calculate the good which an institution properly founded is susceptible of promoting in the improvement of the intellect, taste, and morals of the country." It was deemed presumptuous, however, to express an opinion as to what should be the character of the institution.

Mr. Hassler, then in charge of the Coast Survey, urged on Mr. Adams the establishment of an astronomical school.

On the 5th of March, 1840, Mr. Adams presented an elaborate and extended report to the House of Representatives, reviewing all that had been done relative to the bequest, and presenting the establishment of an astronomical observatory as the best means of carrying out the purposes of Smithson. He gave in detail the arguments in favor of this plan, with estimates for carrying it into effect, and an interesting letter from Mr. Airy, the Astronomer Royal of England, relative to the origin, history, uses, and expenses of the famous Greenwich Observatory. Mr. Adams also gave a masterly summary of the progress of astronomical discovery, painted in the most brilliant colors the achievements of men of science, and portrayed in glowing language the future glory and renown of our country to be derived from the application of the Smithson fund in the manner he proposed.

The impropriety of devoting any portion of the fund to establish a school or college was strongly urged, and he said, "We should in no case avail ourselves of a stranger's munificence to rear our children." It is not clear how the learned and distinguished gentleman reconciled his apparent inconsistency in advocating the use of the fund for the establishment of "a *national* observatory to be superior to any other devoted to the same science in any part of the world," and which would "make an impression upon the reputation of the United States throughout the learned and scientific world." The desire of increasing the brightness of our name in the eyes of other nations, and of effacing a stain he detected upon the national escutcheon on account of our lack of an observatory, rendered him insensible or indifferent to the merits of any other plan for the increase and diffusion of knowledge. He seems to have been wedded to his favorite scheme, and his whole course in Congress in relation to the bequest was governed by it. After provision had been made for astronomical observations by the general government he still advocated no other plan, and even went so far as to declare that he would rather see the money of Smithson thrown into the Potomac than to have it devoted to the advance of education.

It appears that, without debate or explanation, a section was added to the regular appropriation bill, passed 7th July, 1838, for the support of the United States Military Academy at West Point, by which it was enacted that all the money arising from the bequest of Smithson should be invested, when received, by the Secretary of the Treasury, with the approbation of the President of the United States, in stocks of States bearing not less than five per cent. interest, and that the annual income accruing on the stock should also be reinvested in the same way for the increase of the fund.

In accordance with this law, Mr. Levi Woodbury, Secretary of the Treasury, inserted an advertisement in the Washington Globe of August 6, 1838, asking for proposals from those having State stocks to dispose of. A large number of offers were received. Five per cents. of Indiana were offered at par, 98, and 99; of Louisiana, at 98; New York, 102; Maine, 98½ and par; Massachusetts, 104; Kentucky, par; of five and a quarter per cents., Tennessee, at 99½; of five and a half per cents., Missouri, at 102 and par; and of six per cents., Michigan, at par; Virginia, par; Illinois, 104, and Arkansas, 99$\frac{3}{10}$. Mr. Woodbury accepted the offer of Mr. W. W. Corcoran, of the Arkansas bonds, and purchased $500,000 of them for the sum of $499,500. Subsequently he procured $38,000 more bonds of Arkansas, $8,000 Michigan, $56,000 Illinois, and $18,000 Ohio bonds.

The two bills of Mr. Robbins and Mr. Adams, representing the university and the observatory plans, were reported together to Congress. The former was laid on the table, but the latter not acted on, on account of the pressure of other business at the close of the session.

In 1841, Mr. Lewis F. Linn, of Missouri, introduced a bill in the Senate to appoint trustees for the investment of the Smithson fund, and for the organization of an institution with a superintendent and six professors, to be nominated by the "National Institute," a society which had been formed in Washington for the promotion of science, and many of whose members were anxious to obtain control of the bequest. Mr. Linn proposed that all the collections of art and of natural history owned by the United States should be given to the Smithsonian Institution, but all the buildings, collections, &c., should be under the supervision of the National Institute. This bill was referred to the Library Committee, and a substitute was reported by Mr. Preston on the 17th February, 1841, providing for the incorporation of the National Institute, and the establishment of a Smithsonian Institution, with a superintendent and six professors, to be elected by the board of managers of the former, the officers of the institute and the superintendent of the Smithsonian Institution to constitute a board of management of the Smithson fund, to plan and erect buildings, procure books, apparatus, collections, &c. It was provided that all works of art, and all books relating thereto, and all collections and curiosities belonging to the United States were to be transferred to the Smithsonian Institution. The ground known as the Mall was appropriated for the buildings and use of the establishment. Nothing resulted however from this proposition.

Through the efforts of Mr. Adams, the act of 7th July, 1838, requiring the investment of the Smithson fund in State stocks, was repealed, and by an act of September 11, 1841, the Secretary of the Treasury was directed to invest the accruing interest thereafter only in United States stock.

President Tyler, in his message at the opening of the Twenty-seventh Congress, urged the propriety of making a specific application of the funds derived from the will of Smithson, and said he felt confident that "no abatement of the principal would be made should it turn out that the stocks in which the fund had been invested had undergone depreciation."

The Senate referred the message to the Library Committee, Mr. Preston, chairman, and the House to a select committee of nine, of which Mr. Adams was again chairman. Mr. Preston soon after reported the bill he had offered at the previous session for combining the National Institute and the Smithsonian Institution, but this was laid upon the table on the 18th July, 1842. Mr. Adams presented a report and bill in the House on the 12th April, 1842, providing for the incorporation of the Smithsonian Institution; that all the money received from the bequest should be placed to the credit of a fund to be denominated the Smithsonian fund, to be preserved undiminished and unimpaired, and to bear interest at 6 per cent. per annum. The interest of this fund was to be appropriated for the erection and establishment of an astronomical observatory, the publication of the observations, and of a nautical almanac.

About this period memorials were presented to Congress in favor of appropriating the fund for the purpose of awarding annual prizes for the best original essays on the various subjects of the physical sciences, for the establishment of an agricultural school and farm, for organizing a system of simultaneous meteorological observations throughout the Union under the direction of Professor Espy, &c.

No definite action was had on any of these propositions, and President Tyler again called the attention of Congress in his message of December 5, 1843, to their neglect of an important duty. The subject was referred to the Joint Library Committee, of which Hon. Rufus Choate was chairman.

Mr. Tappan, from this committee, reported a bill on the 6th June, 1844, providing that the original amount received as the bequest of Smithson, $508,318.46, be considered as a permanent loan to the United States, at 6 per cent. interest, from the 3d December, 1838, when the same was received into the Treasury; that the interest which accrued to the 1st

July, 1844, viz, $178,604, be appropriated to the erection of buildings and inclosure of grounds for the Smithsonian Institution; that the business of the institution should be conducted by a board of twelve managers from different States or Territories; that a plain and substantial building be erected, with rooms for a museum, library, chemical laboratory, lectures, arboretum; all the objects of natural history belonging to the United States to be transferred to said institution, exchanges of duplicate specimens to be made, a superintendent to be appointed to be professor also of agriculture and horticulture, additional professors of natural history, chemistry, astronomy, and such other branches as the wants of science may require, "excluding law, physic, or divinity," experiments to be made to determine the utility of new fruits, plants, and vegetables, and finally students to be admitted to the institution gratuitously.

Mr. Adams in February, 1844, succeeded in having a select committee of nine appointed to consider the proper disposition of the fund, and in behalf of this committee made a third elaborate and comprehensive report, together with a bill providing for the appropriation of $800,000 as the Smithson fund, to be permanently invested in stock of the United States at 6 per cent. interest, and the income to be devoted, as he had before recommended, for an observatory and nautical almanac.

On the 12th December, 1844, Mr. Tappan introduced a bill in the Senate of a similar character to the one he had offered before, but in addition specified that the books to be purchased for a library should consist of works on science and the arts, especially such as relate to the ordinary business of life and to various mechanical and other improvements and discoveries. In prescribing the duties of professors and lecturers, special reference was to be had to the productive and liberal arts, improvements in agriculture, horticulture, and rural economy. Seeds and plants were to be distributed throughout the country, soils were to be analyzed; the professor of natural history was to refer in his lectures to the history and habits of useful and injurious animals; the professor of geology was to give practical instruction in the exploration and working of mines; the professor of architecture was to give instruction as to the best materials and plans for building; the professor of astronomy was to give a course of lectures on navigation and the use of nautical instruments. It was also provided that works in popular form on the sciences and the aid they bring to labor should be published and distributed.

In the discussion to which this bill gave rise in the Senate on the 8th of January, 1845, Mr. Choate made the brilliant speech which is referred to in the North American Review as "a splendid offering on the shrine of literature by one of her most gifted votaries, and one which, in future times, will render more memorable the day on which it was delivered than that gallant military achievement of which it is the anniversary. No prouder monument than this would be needed for his fame."*

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* *North American Review*, vol. 79, p. 459.

In this famous speech, Mr. Choate remarked that "our sense of duty to the dead, the living, and the unborn who shall live; our justice, our patriotism, our policy, common honesty, common decorum, urge us, are enough to urge us, to go on without the delay of an hour, to appropriate the bounty according to the form of the gift." He opposed anything like the school or college proposed by Mr. Tappan on the ground of its narrow utilitarianism, as being wholly unnecessary and in a great degree useless. It would injure the universities already in existence; it would be exceedingly difficult to secure students; the expense of professors, books, apparatus, and buildings would secure a pretty energetic diffusing of the fund but not much diffusion of knowledge. He approved of the suggestion that lectures should be delivered, especially during the sessions of Congress, not by professors permanently fixed on annual salaries, but by gentlemen eminent in science and literature, to be invited to Washington under the stimulus and with the ambition of a special and conspicuous retainer. He preferred however that the one simple object of the Institution should be to accumulate a grand and noble public library, one which for variety, extent, and wealth should be equal to any in the world. He claimed that this scheme was the only one that "would prevent the waste of money in jobs, salaries, sinecures and quackeries, and would embody Smithson's idea in some tangible form, some exponent of civilization, permanent, palpable, conspicuous, useful, and than which nothing was safer, surer, or more unexceptionable."

Mr. Choate presented many interesting facts in regard to the public libraries of the world, and argued in his peculiarly forcible and eloquent manner that such a plan as he proposed was within the terms and spirit of the trust.

"That directs us to 'increase and diffuse knowledge among men. And do not the judgments of all the wise; does not the experience of all enlightened states; does not the whole history of civilization concur to declare that a various and ample library is one of the surest, most constant, most permanent and most economical instrumentalities to increase and diffuse knowledge? There it would be, durable as liberty, durable as the Union; a vast storehouse, a vast treasury of all the facts which make up the history of man and of nature, so far as that history has been written; of all the truths which the inquiries and experiences of all the races and ages have found out; of all the opinions that have been promulgated; of all the emotions, images, sentiments, examples, of all the richest and most instructive literatures; the whole past speaking to the present and the future—a silent, yet wise and eloquent teacher. * * *

"If the terms of the trust then authorize this expenditure, why not make it? Not among the principal, nor yet the least of reasons for doing so, is, that all the while that you are laying out your money, and when you have laid it out, you have the money's worth, the value received, the property purchased on hand to show for itself and to speak for itself. Suppose the professors provided for in the bill should gather a little circle of pupils, each of whom should carry off with him some small quotient of navigation, or horticulture, or rural economy, and the fund should thus glide away and evaporate in such insensible, inappreciable appropriations, how little there would be to testify of it! Whereas here all the while are the books; here is the value; here is the visible property; here is the oil and here is the light. There is something to point to, if you should be asked to account for it unexpectedly, and something to point to if a traveler should taunt you with the collections which he has seen abroad, and which gild and recommend the absolutisms of Vienna or St. Petersburgh. * * *

"But the decisive argument is, after all, that it is an application the most exactly adapted to the actual literary and scientific wants of the States and the country. I have said that another college is not needed here because there are enough now, and another might do harm as much as good. But that which is wanted for every college, for the whole country, for every studious person, is a well-chosen library, somewhere among us, of three or four hundred thousand books."

Mr. Tappan, in reply, urged that Smithson's own habits and pursuits should be considered; that it must be remembered that he was an eminently practical philosopher, intimately acquainted with chemistry, mineralogy, geology, and natural history, to the minute study of which he devoted his life. His favorable resort had been the *Jardin des Plantes*, at Paris, and there could be but little doubt that in making his bequest he had in view the establishment of a similar institution. He deprecated the outlay of a large amount in the purchase of books, and asserted that they not only did not promote knowledge, but that one-half of those then in the Library of Congress were to be considered as trash.

Mr. Levi Woodbury, of New Hampshire, favored the employment of lecturers, and the purchase of a moderate-sized library, but preferred that the management of the bequest should be intrusted to the National Institute, a society already in active operation, created by Congress, and the objects of which were appropriate to the trust.

Mr. John J. Crittenden, of Kentucky, thought the purchase of books should be confined to works on science and the arts. Mr. James A. Pearce, of Maryland, concurred in the views of Mr. Choate. Mr. Wm. C. Rives, of Virginia, believed that by knowledge was not merely meant the natural sciences, astronomy, mathematics, &c.; he considered the most important of all the branches of human knowledge that which related to the moral and political relations of man. The field of moral science also embraced a much larger portion of knowledge than the physical sciences. He suggested the "Faculty of letters and sciences" under the auspices of the University of France, as a much better model for the Smithsonian than the *Jardin des Plantes*. He remarked that it was his "firm and solemn conviction that we now have it in our power to do more good to this nation in our day and generation, by a judicious and wise application of this $500,000 which has been put into our hands, than by the application of the twenty-five or thirty millions we are in the habit of annually appropriating."

Mr. Choate's amendments were adopted by the Senate and the bill recommitted to be more fully matured. It was again reported to the Senate on the 2d of January, including Mr. Choate's plan of a great library. Mr. Woodbury endeavored again to place the Institution under the management of the National Institute, but was opposed by Senators Buchanan, Choate, and Tappan, on the ground that it was anti-republican and anti-democratic to surrender all control by the people's representatives in respect to a trust committed to their custody for the people's benefit, and to place it in the hands of a close body wholly irresponsible to either Congress or the people.

Mr. Woodbury replied with warmth that his plan, instead of being antagonistic to Congress, made it more in subordination to it, and placed stronger safeguards against any possible departure from its commands or wishes. He also believed that it would be placing a burden on the Institute rather than conferring a favor upon it.

Mr. Buchanan "could imagine no other mode of using the fund" to advantage, than "the purchase of a great library," and strongly opposed any connection with the National Institute.

Mr. William Allen, of Ohio, expressed his opposition to "any plan whatever for connecting anything called an *institution* with the public treasury." He had never known a single instance of a fund of money, charitable or otherwise, being intrusted to the care of an incorporated body of men "that was not squandered and made to fall short of the object of the donor." He wished to see no institution established in the capital of the United States to teach the American people how to think, and read, and speak, and he therefore opposed the whole project.

Mr. Robert J. Walker, of Mississippi, defended the National Institute against the attacks made upon it; showed that it was worthy of and had received the greatest encouragement and most general favor, and claimed that an institution bearing the name of a foreigner never could concentrate in the same degree the affections and confidence of the American people.

After some further debate the bill was laid over for several days, but was taken up and passed on the 23d of January, 1845. When it reached the House, a substitute was offered for it by Mr. Robert Dale Owen, of Indiana; but in the hurry of a short session of Congress the whole matter was left undisposed of.

On the opening of the Twenty-ninth Congress, Mr. Owen again offered his bill to establish the Smithsonian Institution, and it was referred to a select committee of seven members, viz, Messrs. Owen, of Indiana, John Q. Adams, of Massachusetts, Timothy Jenkins, of New

York, George P. Marsh, of Vermont, Alexander D. Sims, of South Carolina, Jefferson Davis, of Mississippi, and David Wilmot, of Pennsylvania.

On the 28th of February, 1846, Mr. Owen, from this select committee, reported an elaborate bill embracing the principal features of Mr. Tappan's bill of the last session, but adding a section providing for a normal branch to give such a thorough scientific and liberal course of instruction as may be adapted to qualify young persons as teachers of our common schools and to qualify students as teachers or professors of the more important branches of natural science. A library was to be procured composed of valuable works pertaining to all departments of human knowledge. Special reference was to be made by the professors to the increase and extension of scientific knowledge generally, by experiment and research. Essays, pamphlets, magazines, manuals, tracts on science, history, chemistry, school-books, apparatus, &c., were authorized.

In advocating this bill Mr. Owen made a very able and impressive speech, and one of the most memorable occurring in the discussion of the subject of the disposition of the bequest. He condemned the dilatoriness of Congress in waiting for ten years, after solemnly accepting the trust, without doing anything whatever to carry out the intention of the donor.

"Small encouragement," he remarked, "is there, in such tardiness as this, to others, as wealthy and as liberal as Smithson and Girard, to follow their noble example! Small encouragement to such men to entrust to our care bequests for human improvement! Due diligence is one of the duties of a faithful trustee. Has Congress, in its conduct of this sacred trusteeship, used due diligence? Have its members realized, in the depths of their hearts, its duties and their urgent importance? Or has not the language of our legislative action rather been but this: 'The Smithsonian fund! Ah, true! That's well thought of. One forgets these small matters.'"

Mr. Owen reviewed all the legislative proceedings in relation to the subject, the various plans brought forward from time to time for adoption by Congress, and called attention to the fact that the object for which Mr. Adams had labored with so much zeal and perseverance—an astronomical observatory—had already been established in Washington. He then made an elaborate reply to Mr. Choate's arguments in favor of a great library. He admitted that "in books exists the bygone world. By books we come in contact with the mankind of former ages. By books we travel among ancient nations, visit tribes long since extinct, and are made familiar with manners that have yielded, centuries ago, to the innovating influences of time." He would go as far as the farthest in his estimate of the blessings which the art of printing had conferred upon man; but such reasoning had no relation to the proposal embraced in Mr. Choate's scheme.

"It substantiates not at all the propriety of spending half a million, or two or three half millions of dollars to rival the bibliomaniacs of Paris and of Munich.

"Books are like wealth. An income we must have to live; a certain amount of income to live in comfort. Beyond a certain income the power of wealth to purchase comfort, or even wholesome luxury, ceases altogether. How much more of true comfort is there in a fortune of a million of dollars than in one of fifty, or say a hundred thousand? If more there be, the excess is hardly appreciable; the burden and cares of a millionaire outweigh it tenfold. And so, also, of these vast and bloated book-gatherings that sleep in dust and cobwebs on the library shelves of European monarchies. Up to a judicious selection of thirty, fifty, a hundred thousand volumes, if you will, how vast, yea, how priceless, is the intellectual wealth! From one to five hundred thousand, what do we gain? Nothing? That would not be true. A goblet emptied into the Pacific adds to the mass of its waters. But if, within these limits, we set down one book out of a hundred as worth the money it costs, we are assuredly making too liberal an estimate.

"Our librarian informs me that the present Congressional library (certainly not one of the most expensive,) has cost upwards of three dollars a volume; its binding alone has averaged over a dollar a volume. The same works could be purchased now, it is true, much more cheaply; but, on the other hand, the rare old books and curious manuscripts necessary to complete a library of the largest class would raise the average. Assuming, then, the above rate, a rival of the Munich library would cost us a million and a half of dollars; *its binding alone* would amount to a sum equal to the entire Smithsonian fund as originally remitted to us from England.

"And thus not only the entire legacy, which we have promised to expend so that it shall increase and diffuse knowledge among men, is to be squandered in this idle and bootless rivalry, but thousands on thousands must be added to finish the work; from what source to be derived, let its advocates inform us. And when we have spent thrice the amount of Smithson's original bequest on the project, we shall have the satisfaction of believing that we may possibly have saved to some worthy scholar a hundred, or perchance a few hundred, dollars, which otherwise he must have spent to obtain from Europe half a dozen valuable works of reference!"

The most important feature of Mr. Owen's bill was however considered by him to be the provision for normal-school instruction. He maintained it to be the duty of Congress to elevate to the utmost the character of our common schools. The normal branch was not intended by him to take the place of similar institutions in the States; it would be supplemental to these, but of a higher grade, and would enable young persons who had passed through the former to perfect themselves in "the most useful of all modern sciences—the humble yet world-subduing science of primary education." It would also be the place where we might hope to find trained, competent, and enlightened teachers for the State normal schools.

He also specially urged the importance of scientific researches.

"In these," he said, "Smithson spent the greater part of his life. And it cannot be doubted that were he yet alive and here to-day to explain his wishes, *original researches in the exact sciences* would be declared by him a part of his plan. With the knowledge of his life and favorite pursuits before us, and the words of his will specifying the *increase* as well as the diffusion of knowledge for our guide, it seems nothing less than an imperative duty to include scientific research among the objects of a Smithsonian Institution."

Mr. George W. Jones, of Tennessee, made himself conspicuous on this, as on many other occasions, by bitter opposition to the adoption of any plan for the organization of the Institution. He believed that the whole matter was wrong; that the government had no right to accept of the trust, and he proposed that the whole fund, in whatever form it might be, whether money or State bonds, should be returned to any of the heirs-at-law or next of kin of Mr. Smithson. He maintained that—

"It was neither the right, the power, or the true policy of the government to attempt to rear upon the city of Washington an institution for the education of school teachers, agricultural professors, &c., to send out into the country. . . . Every measure of this kind had the tendency to make the people throughout the country look more to this great central power than to the STATE governments."

Mr. Joseph R. Ingersoll, of Pennsylvania, favored the bill of Mr. Owen, and ridiculed the idea of Mr. Jones of returning the money to England. He thought that a great library was not desirable, and said that the necessary building to contain the greatest library in the world would in its own erection exhaust the entire bequest. The Capitol itself would not contain eight hundred thousand volumes so properly arranged as to be accessible. A library was not the object of Smithson. A plan should be adopted to cover general ground, in which all objects of science should be included. He favored that part of the bill providing for normal instruction, and would add an appropriation for defraying the expense of the delivery of lectures by our most distinguished men at different points throughout the country for scientific instruction.

Mr. Frederick P. Stanton, of Tennessee, in a brilliant and eloquent address to the House, supported the bill in its present form. He maintained that it was the result of the conflicting opinions of wise and experienced men, harmonized by comparison, discussion, and mutual concession. He dwelt at length on the importance of advancing science, the value of experimental research and observation; explained and advocated every section of the bill, and concluded by saying: "By proper management this institution may doubtless be made the instrument of immense good to the whole country. To the government it will be of no slight advantage. It will be a great institution. It may attain a character as high as that of the French Academy, and its authority will then be decisive in reference to numerous questions of a scientific nature continually presented to the committees of Congress and the departments of government for determination and consequent action. Such an institution is greatly needed in the federal city."

Mr. William Sawyer, of Ohio, wanted students to be sent to the Institution selected from the various States and Territories according to the ratio of representation in Congress. He also thought the rate of interest on the fund should be five instead of six per cent.

Mr. D. P. King, of Massachusetts, favored a provision by which students could be educated free of expense, and pay their board by labor on a farm connected with the establishment.

Mr. Jefferson Davis, of Mississippi, advocated the bill as providing for the increase and diffusion of knowledge among men. It was too late to make the objection that the trust ought not to have been accepted. It was our duty to carry it into execution; and as to the fund, it ought to be considered as money still in the Treasury, unconnected with any investment the officers of the government may have made. He regarded *lectures* as the greatest means of extending knowledge which had been adopted in modern times. It was second only to the invention of the art of printing. He would admit that the government had no authority to take charge of the subject of education, but he did not consider this bill as liable to that objection. The normal school system he considered as highly beneficial, serving to produce uniformity in the language, and to lay the foundation of all sciences. The spelling-book of Noah Webster, which had been used extensively in our primary schools, had done more to produce uniformity in our language in this country than anything else. If we sent out good school-books from this institution, it would be of vast service to the country. He enlarged upon the benefits which would result to science and the diffusion of every kind of useful knowledge from an institution which would gather young men from the remotest parts of the country at the common point where every facility for practical instruction would be afforded. The taste of the country would be refined, and he did not consider this as anti-democratic. Knowledge was the common cement that was to unite all the heterogeneous materials of this Union into one mass, like the very pillars in the hall of the House before them.

Mr. Geo. P. Marsh, of Vermont, said that whatever plan was adopted must of necessity be one of compromise, and that though he would have preferred the Senate bill for a library, yet he would cheerfully accede to the present one as proposed to be modified. He regarded it as an experiment which admitted, and which he trusted would hereafter receive, great changes in its conditions rather than as a complete working model. Two objects were aimed at by Smithson: first, the *increase* of knowledge—its enlargement, extension, progress; second, the *diffusion* of knowledge—its spread, communication, dissemination. Of the various instrumentalities for carrying out this noble and imposing scheme, he considered as the simplest and most efficient the collection for public use of a library, a museum, and a gallery of art, and he preferred that for a reasonable period the entire income of the fund should be expended in this way. While appreciating the value of research and experiment in natural knowledge and the economic arts, and including them in the plan of a great national institution for the promotion of all good learning, he dissented from the doctrine implied by the bill, which confined all knowledge, all science, to the numerical and quantitative values of material things.

"Geology, mineralogy, even chemistry, are but assemblages of apparent facts, empirically established, and this would always be true of every study which rests upon observation and experiment alone. True science is the classification and arrangement of necessary primary truths according to their relations with each other and in reference to the logical deductions which may be made from them. Such science, the only absolute knowledge, is the highest and worthiest object of human inquiry, and must be drawn from deeper sources than the crucible and the retort. A laboratory is a charnel-house; chemical decomposition begins with death, and experiments are but the dry bones of science. It is the thoughtful meditation alone of minds trained and disciplined in far other halls that can clothe these with flesh and blood and sinews, and breathe into them the breath of life."

Mr. Marsh then showed the importance and value of a great library, and gave illustrations from his extensive knowledge of the libraries in Europe.

Mr. Isaac E. Morse, of Louisiana, was of the opinion that Smithson was a practical man, and that, although possessed of the highest learning, he condescended to devote his time to subjects of the most domestic and homely character. If his intention had been to establish a university or a magnificent library, and thus to have his name transmitted to posterity, it would have been easy for him to have said so, and nothing would have been left to this country but to carry out his enlightened and liberal intentions. But he had no doubt studied the peculiar character of the American people, and discovered that while they entertained a proper respect for the learning and genius of the German universities and of the sciences taught in the schools of Europe, still there was something in the common sense and practical knowledge of our people which comported with his own notions; and he desired that his money should be devoted to diffusing practical and useful knowledge among them. Mr. Morse then introduced a new bill as a substitute for that under discussion, providing mainly that "an offer be made through the newspapers of the United States and Europe of suitable rewards or prizes for the best written essay on ten subjects, the most practical and useful of which should be printed and widely distributed," thus fulfilling, in the letter and spirit, the wise and comprehensive intentions of the donor for the increase and diffusion of knowledge among men.

Mr. John S. Chipman, of Michigan, spoke earnestly in opposition to the bill. He thought that our great and powerful government, prospering and progressing as it was in original native intellect, fostered by institutions known to no other country and no other people, should not have consented to be the recipient of what was called a munificent donation of half a million from an Englishman to enlightened American republicans in this country. "How did it happen," he exclaimed, "that this government accepted such a boon from a foreigner—an Englishman too!"

After further debate, Mr. Adams moved that until the arrears of interest due from the States in which the money of Smithson had been invested were paid, no appropriation should be made by Congress for the fulfillment of the purposes prescribed by the testator.

Mr. A. D. Sims, of South Carolina, thought that he saw in the will of Smithson only what he had observed in other instances. "After having griped through their lives every shilling that came into their hands, animated at last by some posthumous vanity, they sought to build up a name which should live after them; and such, rather than any feeling for humanity, was the motive that guided them." He then proceeded to contend that the Government of the United States was not instituted for any such purpose as the administration of charities. He would introduce a bill repealing all laws heretofore enacted on this subject and giving authority and direction for the restoration of the money to the British chancery, where it could be devoted to purposes in England similar to those which had been contemplated in the city of Washington. The only difference would be in the location of the institution.

Mr. Adams proceeded to explain and advocate his substitute, and maintained that in the administration of this fund there were two or three principles that should be observed. One was, that it should never cost the people of the United States a dollar—that it should support itself; another, that no part should ever be applied to the ordinary purposes of education. It was unworthy the people of the United States to receive foreign aid for this purpose. There was no way in which the States could more degrade themselves than by relying on foreign aid or on the General Government for the education of their children.

"But an experience of eight or ten years, since we received this money, had shown him that whenever distinguished scientific men were called upon for their opinions, scarcely two agreed.

"In addition to the application of a certain part of this fund to the science of astronomy, there was another provision which he found, and which he was happy to see this bill made, viz, that no portion of the fund should be appropriated—that it should be a perpetual fund. It was the interest which was to be applied.

"But in the mean time, while this delay had taken place, he was delighted that an astronomical observatory—not perhaps so great as it should have been—had been smuggled into the number of the institutions of the country under the mask of a small depot for charts, &c.

"He claimed no merit for the erection of the astronomical observatory; but in the course of his whole life no conferring of honor, of interest, of office, hàd given him more delight than the belief that he had contributed, in some small degree, to produce these astronomical observatories, both here and elsewhere. He no longer wished any portion of Smithson's fund applied to an astronomical observatory.

"Nor did he think it important to the people that any provision of this bill should be carried into effect immediately, but rather that measures should be taken to induce the States to pay the interest on their bonds, and then let the money be appropriated to any purpose on which Congress could agree more unanimously than on this bill."

Mr. Andrew Johnson, of Tennessee, was opposed to taking any money out of the Treasury of the United States to establish such an institution.

Mr. George Rathbun, of New York, did not feel disposed to object to any plan with seeming plausibility. He was in favor of expending the money in some way and upon some scheme, faithfully and honestly, but, above all, he was in favor of appropriating the money whether the final result should be good or not. He wished to wipe out the stain which rested on the character of this Government of withholding the money because we were not able to discover the best mode of expending it. In his judgment, a library was the least plausible of any of the schemes proposed.

Mr. Orlando B. Ficklin, of Illinois, opposed the bill. He thought however that the good faith of the Government required that this money should be considered as being in the Treasury, and that we could not excuse ourselves by saying that the fund had been loaned out to the States and could not now be realized. He objected, however, to the connection proposed to be established between this institution and the United States Treasury. A million of dollars would be required to meet the deficiency in this Smithsonian bequest. He was willing to expend the money for a library, and for scientific apparatus, or for any plan by which the fund could be disconnected from the Government. He regarded Mr. Owen's bill as one of the most odious and abominable ever presented, and he would rather see this half million returned to the British court of chancery, or ten millions sunk to the bottom of the Potomac, than to have this bill pass.

Mr. Allen G. Thurman, of Ohio, made inquiries respecting the original investment of the fund, and then discussed the duties of a trustee. He could not vote for the bill unless it were most materially changed. He was opposed to the erection of an immense institution at the city of Washington, that would ultimately become a charge upon the Treasury and would necessarily be partial in its operations and benefits. He was inclined to favor the library plan, although there were great objections to it. But "there was one recommendation it possessed that strongly influenced him. That was, that though it might not effect the greatest amount of benefit that could be produced by the fund, it was not liable to the abuses to which all the other plans would probably give rise. It would create no large body of office-holders, no patronage, no favoritism, no partially sectional advantages."

Mr. Owen replied to Mr. Adams, and showed that the position of the latter as to the condition of the fund was entirely inconsistent with the reports and bills he had so often presented. He was not specially wedded to the feature of normal schools, although he believed it was the most important one in the bill. As to the disgrace of educating our children with foreign aid, there was no proposition in this bill to educate children, but the teachers of children. And as to disgrace, it might be said with equal propriety that it was disgraceful to receive foreign aid for founding a library.

Mr. Andrew Johnson renewed his attack on the bill:

"There was something a little farcical and amusing [to him] in this system of normal instruction, which was to provide the country with school teachers. He would like to see a young man, educated at the Smithsonian Institution and brought up in all the extravagance, folly, aristocracy, and corruption of Washington, go out into the country to teach the little boys and girls to read and write! Those young men, so educated, would steal, or play the little pettifogger, sooner than become teachers. Ninety-nine out of a hundred of those who received the benefit of this institution would hang about a law-office, get a license, become a pack of drones instead of schoolmasters. Washington City was not a place for such an institution. He believed that it would result in an injury to the country instead of a benefit."

Mr. John Bell, of Tennessee, held that the United States was responsible for the fund and ought to appropriate it for its object. He hoped that Arkansas would one day pay the money, but he feared it would be a distant day. It was necessary to act now. He did not wholly approve of the bill reported, but he would take it rather than do nothing.

Mr. Hannibal Hamlin, of Maine, regarded this fund as one which had been received by the Government to carry out the intentions of Mr. Smithson, and to which, by their acceptance, they had solemnly bound themselves. He alluded to the difficulty—nay, the impossibility—of any select committee agreeing upon a plan which, in all its details, should be in accordance with the views of all. Notwithstanding this, he trusted we should not let this opportunity go by to make a commencement in this matter. He had not the slightest doubt of the full and unqualified power of this Government to take charge of this money and give it the direction required by the will of Mr. Smithson.

While there were features in the bill with which he was not entirely pleased, he should vote for the bill in case it was not amended. But there were some amendments to the bill of the gentleman from Indiana [Mr. Owen] to which he would fain hope that gentleman himself would lend a favorable ear. One related to the appropriation of a part of it to the science of agriculture. He referred to the general and deplorable want of information of the components of the soil, the proper mode of treating it, the proper adaptation of crops to different soils, &c., and said he wished to see connected with this institution a department of agricultural chemistry and a professor of agriculture proper.

Mr. Bradford R. Wood, of New York, said that if ever there was a point in which the national honor was concerned, it was in carrying out the intentions of the testator in his bequest. He considered it an honor to the country that the subject of a monarchical government should have selected this as the instrument of his expansive benevolence. He thought normal instruction should be left to the States, but responded heartily to Mr. Hamlin's suggestion in relation to agricultural instruction. He would do all he could to increase and diffuse useful knowledge among the masses, but this could not and would not be attained by such education as would be obtained here, or by collecting at this point a splendid library. The latter might, and unquestionably would, benefit those already learned, but not the people.

Mr. William F. Giles, of Maryland, proposed an amendment, providing for the publication and distribution of books for the instruction of the blind.

Mr. W. W. Wick, of Indiana, discussed the duties of a trustee, and took the ground that the Government of the United States had no discretion in this case as to the mode of investment of the funds. There was no power given by the will of Smithson to invest the money in any special manner, and the Government invested it at its own hazard. If, of his own accord and without authority, a trustee made an investment, he was responsible for it. Thus the United States stood in relation to this matter, and to this extent they were responsible, if at all. The honor of the country should be sustained by the faithful execution of the trust.

Mr. Washington Hunt, of New York, entirely concurred with Mr. Wick's view of the subject. It was a reproach to the government to delay carrying out the purposes of this trust.

At length, after a full and exhaustive debate for two days, the House proceeded to vote on the bill and amendments. The normal school section was stricken out, on motion of Mr. Adams, by a vote of 72 to 42; the provision for professors and lecturers by 77 to 42, as also that for students. Mr. Jones's amendment, to return the money to England, received 8 votes in the affirmative to 115 in the negative. Mr. Adams's proposition, to defer the organization of the institution until the State of Arkansas could be induced by "moral suasion to pay up its indebtedness for interest," was voted down by 74 to 57. The provision for lectures was negatived by 72 to 39, while the annual appropriation for a library was increased, on motion of Mr. Marsh, from $20,000 to $25,000. The sections requiring experiment and research in agriculture, manufactures, &c., the publication of books, pamphlets, tracts, &c., and the offering of prizes for essays, were stricken out. An amendment that all copyright books, maps, charts, prints, &c., should be delivered to the institution was adopted, and also one that the Government collections deposited in it should be known as the National Museum.

Before a vote was taken on the bill as amended, a substitute for it was introduced by Mr. William J. Hough, of New York, retaining most of the features already agreed upon, and this was passed in the Committee of the Whole by a vote of 83 to 40. It was then reported to the House, and passed by a vote of 85 to 76.*

Among the prominent men in the affirmative were John Q. Adams, John Bell, Garret Davis, Jefferson Davis, Columbus Delano, Stephen A. Douglas, Solomon Foot, Joshua R. Giddings, Hannibal Hamlin, H. W. Hilliard, George P. Marsh, R. D. Owen, F. P. Stanton, A. G. Thurman, Samuel F. Vinton, David Wilmot.

Among the nays were Howell Cobb, R. M. T. Hunter, J. R. Ingersoll, Andrew Johnson, George W. Jones, Preston King, Alexander H. Stephens, and Jacob Thompson.

On the 10th of August, 1846, the Senate proceeded to consider this bill; amendments proposed were disagreed to, and it passed without debate by 26 to 13. The yeas were, Messrs. Archer, Atchison, Barrow, Berrien, Cameron, Cilley, Thomas Clayton, John M. Clayton, Corwin, Davis, Evans, Greene, Houston, Huntington, Jarnagin, Johnson of Maryland, Johnson of Louisiana, Lewis, Mangum, Miller, Morehead, Phelps, Speight, Spurgeon, Upham, Webster.

Those who voted in the negative were, Messrs. Allen, Ashley, Atherton, Bagby, Benton, Calhoun, Dickinson, Fairfield, McDuffie, Semple-Turney, Westcott, Yulee.

The bill was signed by President James K. Polk on the 10th of August, 1846, and became a law, and the Smithsonian Institution was organized under it with the following Board of Regents:

Hon. GEO. M. DALLAS, of Pennsylvania, *Vice-President of the United States, ex officio.*

Hon. ROGER B. TANEY, of Maryland, *Chief Justice of the United States, ex officio.*

Hon. WILLIAM W. SEATON, *Mayor of the city of Washington, ex officio.*

Hon. GEORGE EVANS, of Maine; Hon. ISAAC S. PENNYBACKER, of Virginia; Hon. SIDNEY BREESE, of Illinois, *of the United States Senate,* appointed by President of the Senate.

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* The Congressional proceedings and debates in relation to the Smithson bequest are reprinted in full in the Smithsonian Miscellaneous Collections, No. 328, 1879. "The Smithsonian Institution: *Documents relative to its origin and history.*" Edited by William J. Rhees. 1027 pp., 8°. 1879.

Hon. William J. Hough, of New York; Hon. Robert Dale Owen, of Indiana; Hon. Henry W. Hilliard, of Alabama, *of House of Representatives*, appointed by the Speaker.

Hon. Rufus Choate, of Massachusetts; Hon. Gideon Hawley, of New York; Hon. Richard Rush, of Pennsylvania; Hon. William C. Preston, of South Carolina, *citizens of States*, elected by Congress.

Alexander Dallas Bache, *Member of the National Institute;* Joseph G. Totten, *Member of the National Institute, citizens of Washington*, elected by Congress.

APPENDIX.

NOTE 1.

OBITUARY NOTICE OF JAMES SMITHSON.

(From the Gentleman's Magazine.)

"*Oct.* 1829.—Died: In the south of France, James Smithson, esq., M. A., F. R. S.

"The birth of this gentleman is thus described by himself at the commencement of his will: 'I, James Smithson, son of Hugh, first Duke of Northumberland, and Elizabeth, heiress of the Hungerfords of Studley, and niece to Charles, the proud Duke of Somerset.'

"It is well known that the *wife* of Hugh, first Duke of Northumberland, was Lady Elizabeth Seymour, *grand-daughter* of the same 'proud Duke of Somerset.' It was the Hon. Frances Seymour, daughter of Charles, Lord Seymour, of Troubridge, by his first marriage with Mary, daughter and heiress of Thomas Smith, esq.—and thus half sister to the fifth and sixth Dukes of Somerset, the latter of whom was 'the proud duke'—that was married to Sir George Hungerford; but in the account of the family in Sir R. C. Hoare's Hungerfordiana we find no Elizabeth, nor the name of Macie, which was that which Mr. Smithson originally bore. The family of Macie resided at Weston, near Bath.

"James Louis Macie, esq. [the subject of the present notice], was a member of Pembroke College, Oxford, where he was created M. A. May 26, 1786. He was elected Fellow of the Royal Society in 1787, and appears under the same name in the Philosophical Transactions for 1791; but between that date and 1803 he chose to change his name to Smithson, although he continued to enjoy the property of the Macies. He was, we believe, at one time a vice-president of the Royal Society."*

NOTE 2.

ACCOUNT OF THE FIRST DUKE OF NORTHUMBERLAND.

(Father of James Smithson.)

"Sir Hugh Smithson was one of the handsomest men in England. He possessed much talent, a highly-cultured intellect, and more learning than is generally found among the nobility. His parents, though of gentle blood, did not belong to the nobility. He had raised himself by his marriage with the heiress to the name and fortune of the house of Percy, and he showed that he was worthy of both."

[His matrimonial alliance had somewhat of a romantic origin. Sir

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* *Gentleman's Magazine*, March, 1830, vol. c, p. 275.

Hugh had been unsuccessful in a first courtship, and the story of his disappointment reached the ears of Lady Elizabeth Seymour, only daughter of Algernon Seymour, Baron Percy, who was at that time considered, on account of her birth, wealth, and beauty, the greatest prize in the kingdom. Lady Percy expressed to some of her friends 'surprise that any woman should have refused the hand of such a man as Hugh Smithson.' These words soon became known to the rejected baronet, and wrought a change in his feelings and aspirations. He became the suitor of the fair and noble heiress, and married her on the 16th of July, 1740.]

"By his wise economy he improved the immense estates of this family, and increased their value to such an extent that the revenues from them amounted to over forty thousand pounds. He re-established the old grandeur of the Percys by his taste and splendor. The castle of Alnwick, the former residence of the Earls of Northumberland, was entirely ruined. He rebuilt it, and to please the duchess, his wife, he ornamented it in the Gothic style, which he himself did not admire; but he exercised so much taste that he made the castle one of the most magnificent buildings of this kind to be found anywhere in Europe. He improved Sion, a country-house in the environs of London; and he exhausted the resources of all the arts, and of unusual wealth, to fill these two mansions with master-pieces of good taste, and to render them worthy of their possessors. He was created an earl, had the order of the Garter conferred on him, and was afterwards appointed viceroy of Ireland; finally, he was raised to the rank of a duke, and upheld these high positions by an expenditure unequaled at that time.

"The Duchess of Northumberland was of the very highest birth, descending from Charlemagne through Joscelin de Louvain, who had married Agnès de Percy in the year 1168. She brought to her husband, as her marriage portion, several peerages, the name and coat-of-arms of the Percys, and an immense income. She was very high-minded, and of a natural and easy disposition; she was very good-hearted and charitable; above all, she was truly attached to her friends, whom she distinguished and served whenever an opportunity offered.

"The duke was fond of arts and sciences, so I entered into his tastes, discussing all these subjects with him, in which he found that I was well versed, and that he could converse with me on more topics than with any one else. The duchess, on the contrary, had a predilection for little 'jeux d'esprit' in the company of friends, and she found amusement in gathering together engravings, medals, and in collecting a variety of other things. I joined in these pursuits as if I had made them the business of my previous life. In the evening I took part in her social games, and made myself useful to her in her amusements, the only interruption to my attentions being a short trip to Paris."*

From the Gentleman's Magazine for July, 1786, we also learn that "The establishment of his Grace was as magnificent as it was possible for any English nobleman's to be. He had at all times three mansion-houses—and of late four—in occasional use. He spent immense sums in different sorts of very costly decorations; pictures by every master; gardening by Browne; buildings by Adams. . . . More than fifteen

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*[L. Dutens.] "*Mémoires d'un voyageur qui se repose;* contenant des anecdotes historiques, politiques et littéraires relatives à plusieurs des principaux personnages du siècle. Par M. L. D. Troisième édition. 3 vols. 8°. Londres, 1807." Vol. i, pp. 226–228. (This book is in Smithson's library.)

years ago he was able to purchase the property on which Lord Percy had his seat, in Yorkshire; and a few years ago, the mansion, manors, and boroughs of Humphrey Morice, in the West, all were sold to the Duke. In short, the rental, with the dukedom, he left at about 50,000 pounds, and to his second son 10,000 pounds per annum. The duke had negotiated a further improvement of the Northumberland estate, but did not live to see it completed."*

On the death of the Duke of Northumberland, the following obituary notice was given in the same magazine:

"June 6, 1786. At eight o'clock this morning, died at Sion House, in his 74th year, the Most Noble Hugh, Duke and Earl of Northumberland, Earl Percy, Baron Warkworth and Louvaine, Lord Lieutenant and Custos Rotulorum of the counties of Middlesex and Northumberland, and of the town and county of Newcastle-upon-Tyne, Knight of the Most Noble Order of the Garter, and Baronet; who with a princely fortune, sustained his exalted rank through life with the greatest dignity, generosity, and splendor, and will ever be considered as one of the first characters of that age of which he constituted so distinguished an ornament. We are well informed that his annual income was not less than 45,000 l. per annum. His Grace's extensive charities to the poor, his constant encouragement of literature and the polite arts, and his generous patronage of every kind of merit, make his death truly a public loss, and will cause it to be long and sincerely lamented. His Grace was the son of Langdale Smithson, esq., and Philadelphia, daughter of W. Reveley, esq., of Newby, co. York. Upon the death of his grandfather (Sir Hugh Smithson, of Stanwick, Bart.), which happened in 1729, he succeeded to the title of baronet, and to his grandfather's estate; and upon the death of his relation Hugh Smithson, esq., of Tottenham, he came into the possession of other estates in Yorkshire and Middlesex; and also succeeded his relation as knight of the shire for the county of Middlesex, which he represented in three parliaments. Upon the death of his father-in-law, Algernon, Duke of Somerset, whose daughter he had married, he succeeded to the title of Earl of Northumberland, the Duke having been created Earl of Northumberland upon his daughter's marriage, with remainder to her husband, and their issue, after the Duke's death. The reason of this creation was as follows: The Duke's mother (whose third husband was the Duke's father) was daughter and sole heiress of Joscelin, the last Earl of Northumberland, which title was become extinct. Being so great an heiress she was married three times while a minor. First, to the Earl of Ogle, who died in a short time after, leaving no issue. She was next married to Thomas Thynne, esq., of Longleate, co. Wilts, but he was assassinated in Pall Mall by some ruffians hired by Count Coningsmarck, whose object was to marry the widow. Her third husband was the Duke of Somerset, and she was still a minor, as was also the Duke, by whom she had the above Algernon, who succeeded his father as Duke of Somerset, and possessed all the Percy estates. He married Miss Thynne, granddaughter of the first Lord Weymouth, and by her had one son and one daughter. The son died unmarried, and the daughter married in 1740 the subject of this article, then Sir Hugh Smithson. The title of Somerset going to another branch of the Seymour family, the title of Northumberland was revived to the Duke's daughter in consideration of her descent from the daughter of Joscelin the last Earl of Northumberland. The Percy estate also settled in her, together with several baronies, such as Percy, Lucy, Poynings, Fitz-Payne, Bryan, &c. The Duke of Somerset dying in 1750 Sir Hugh Smithson immediately took his seat in the House of Lords as Earl of Northumberland. In 1752 he was appointed one of the Lords of the Bed-chamber to the late King. In 1757 he was installed Knight of the Garter at Windsor. In 1762 he was appointed Lord Chamberlain to the Queen, and a Privy Counsellor; also Lord Lieutenant of the counties of Middlesex and Northumberland. In 1763 he was appointed Lord Lieutenant of Ireland. In 1766 he was created Duke of Northumberland. In 1778 his Grace was appointed Master of the Horse, which he resigned in 1781. On Dec. 5th, 1776, which was her birthday, his Duchess died, when she had completed her sixtieth year. She was interred in her family vault in St. Nicholas chapel, Westminster Abbey. They had two sons and one daughter."*

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* *Gentleman's Magazine*, 1786, vol. lvi, p. 617.

The funeral of the Duke of Northumberland, whose death occurred ten years later, was celebrated with great pomp on the 21st of June, 1786, and his remains were also interred in Westminster Abbey with the following imposing list of titles and dignities inscribed on his coffin.

COFFIN-PLATE INSCRIPTION OF HUGH SMITHSON.

(Father of James Smithson.)

"The most high puissant & most noble Prince
Hugh Percy, Duke & Earle of Northumberland
Earl Percy Baron Warkworth & Lovaine & Bar^{t}
Lord Lieutenant & Custos Rotulorum of the
Counties of Middlesex & Northumberland, of
the City & Liberty of Westminster & of the
Town & County of the Town of Newcastle
upon Tyne, Vice Admiral of the County of
Northumberland & of all America, one of
the Lords of his Majesty's most Hon^{ble}
Privy Council, & Knight of the most noble
Order of the Garter.
Died on the 6th Day of June 1786,
In the 74th Year of his Age."†

NOTE 3.

ACCOUNT OF EARL PERCY, SECOND DUKE OF NORTHUMBERLAND,

(Half brother of James Smithson.)

The first Duke of Northumberland had one daughter, who died unmarried, and two sons—Hugh and Algernon (half brothers of James Smithson)—of whom the elder succeeded his father as the second Duke

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[*] *Gentleman's Magazine*, 1786, vol. lvi, pp. 529, 530.

[†] *Miscellanea Genealogica et Heraldica*, London, 1868, p. 271.

of Northumberland. This son was born August 25, 1742, and married, in 1764, Anne, daughter of John, Earl of Bute, but had no issue. The marriage was dissolved, by act of Parliament, in 1779, and in the same year the duke married Miss Frances Julia Burrell, of Beckenham, Kent, by whom he had five daughters and two sons.

Earl Percy, the second Duke of Northumberland, served in the Continental wars under Prince Ferdinand of Brunswick; came to Boston, 1774, in charge of a brigade; commanded the re-enforcements at the battle of Lexington, April 19, 1775; and led the column that reduced Fort Washington, at King's Bridge, near New York, November 16, 1776. He returned to England in May, 1777, devoted himself to improving his estates, died July 10, 1817, and was buried with great pomp in Westminster Abbey.

Of this Earl Percy an oil portrait has recently been presented to the town of Lexington, Massachusetts, by his grandnephew, Algernon George, the sixth and present Duke of Northumberland. The presentation was made through the Rev. Edward G. Porter, of Lexington, who was a guest at the duke's castle in 1879, and was permitted, during his visit, to make extracts from the Percy family papers, especially from the letters written home by Earl Percy during his American experiences. In one of these letters, dated Boston, July 5, 1774, Percy told his parents that the people were very hot-headed and that he feared trouble. On the 27th of the same month he wrote that, owing to the absence of General Gage at Salem, he had been commander-in-chief of the camp at Boston. He also inclosed a view of the town of Boston and the camp, and conveyed the information that the people say much and do nothing. He advised a steadfast government, as the people are worthy subjects, who talk as though they would wipe out the troops every night, but are frightened to death when they see them. The clergy were spoken of as teachers of sedition of the most virulent type. Another letter to his father was dated August 15, 1774, and in this Percy described the scenery around Boston as having the appearance of a park finely laid out. This beauty he considered to be offset by the poverty of the soil, which, in his opinion, was overtilled and scantily fertilized. In this letter symptoms of trouble in the country were noted, and the writer professed his determination to do his whole duty wherever he might be called upon to serve rather than seek preferment where it might most easily be obtained—at the Court of St. James. In a subsequent letter to General Howe, at London, he wrote his serious apprehension of bloodshed and his belief in the necessity of strong government. From the Congress at Philadelphia he said he looked for either a wrangle among its members or for the origin of serious business for the home government. To his father, also, he wrote in the same strain. On the 20th April, 1775, Percy reported to General Gage about the march to Lexington. There, Percy says, he met the troops retreating from Concord, and he ordered two field-pieces to be trained upon the rebels from the heights. The shot from the cannon dispersed them. As the British had but little ammunition, and were fifteen miles from Boston, they were ordered by him to return. They were pressed severely by the rebels until they reached Charlestown, many men being killed. Percy attributed to the rebels cruelty and barbarity, writing that they scalped and cut off the ears of the wounded troops, showing that the British, too, believed that their opponents were cruel and barbarous. Percy, after this disastrous retreat, was of the opinion that the colonists were not an irregular mob, but determined men, accustomed to fight the French and the Indians. The road to Charlestown, Earl Percy said, was taken for the retreat, as it was feared that the rebels, as they actually did, would have destroyed the bridge over the Charles River. In a letter referring to Bunker Hill, Percy mentions the death of Dr. Warren and that of Major Pitcairn. While Percy was in America he was advanced in rank to be a lieutenant-general, yet he was anxious to return home, and he was allowed to do so near the close of the war. He was the first to suggest making peace with the colonists, and he was selected as minister plenipotentiary to secure such an end. Owing to dissensions in the British cabinet, he delined that honor and retired to private life.

NOTE 4.

NOTICES OF SMITHSON'S PAPERS,

On Tabasheer and Calamine.

(I. From the London Monthly Review.)

" The first paper is an account of tabasheer, an article of importance in the *materia medica* of the ancient Arabians, and still a medicine of great note in many parts of the East, though neither the substance itself nor its origin were known in the Western World. Dr. Russell ascertained it to be a natural concretion from the juice of the bamboo cane, and accordingly it is distinguished in different oriental languages by names signifying bamboo milk, bamboo camphor, and salt of bamboo. Dr. Russell had many green canes brought to him at Madras, and on splitting them, found some joints full of a watery liquid, some with the fluid much diminished and in different states of consistence, and others with some grains or particles of tabasher, either loose, in which case the reeds containing it are known by a rattling sound on shaking them, or adhering to the extremities or sides of the cavity. The quantity of the tabasheer appears to be very inconsiderable, the whole produce of twenty-eight reeds from five to seven feet long, not much exceeding two drachms."*

The following account of his paper in the Philosophical Transactions is given in the Monthly Review for January, 1792, vol. vii, pp. 75, 76.

" We have seen in a former paper that tabasheer is a vegetable production, formed by spontaneous concretion from a fluid in the cavities of the bamboo cane. Its chemical constitution, however, is very different from what might be expected in a body of such an origin. The experiments of Mr. Macie, very judiciously executed, and here stated in detail, show it to be a siliceous earth, nearly the same thing with common flint that has been attenuated by artificial solution.

" Neither water, alcohol, nor acids will act on it, but by imbibing water it becomes transparent; the white bits in a low degree, the bluish nearly as much so as glass. It dissolves (as the precipitate from liquor silicum does) in caustic alcaline lixivium; and the solution (like the liquor silicum itself, or the precipitate redissolved) becomes gelatinous on exposure to the atmosphere. In the fire it becomes harder, more compact, and diminished in volume, without any loss of weight, except of a little moisture, which it soon recovers from the air. With two-thirds of its weight of fixed alkali, in a platina crucible, it ran into a transparent glass; phosphorated ammoniac and litharge readily acted on it; borax more difficultly. It melted, also, at the blow-pipe, where the ashes of the coal happened to touch it, or when rubbed over with calcareous earth; and this appears to be the only property in which it differs materially from flint. This fusibility with calcareous earth, and its contracting and hardening in the fire, might lead us to suspect an admixture of argillaceous earth; but no traces of that earth were discovered by the usual process with vitriolic acid.

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* *Monthly Review* for September, 1791, vol. vi, p. 16.

"The experiments from which these general results are extracted were made on the finest tabasheer that could be purchased at Hydrabad. Several other specimens were examined, and all the genuine sorts were found to consist of the same earth. That which was taken immediately from the cane became black in the fire from some admixture of vegetable matter, but as soon as the blackness disappeared it was in all respects similar to the foregoing, so that the tabasheer of Hydrabad may be presumed to have suffered a degree of calcination before its exposure to sale.

"That a siliceous earth exists in vegetables is evident from their ashes. Mr. Macie obtained a small portion of this earth from the ashes of charcoal, but found it far more abundant in those of the bamboo cane. He mentions a singular circumstance respecting this vegetable which occurred after his experiments were finished:

"A green bamboo cut in the hot-house of Dr. Pitcairn, at Islington, was judged to contain tabasheer in one of its joints from a rattling noise discoverable on shaking it, but being split by Sir Joseph Banks, it was found to contain not ordinary tabasheer, but a solid pebble about the size of half a pea, so hard as to cut glass."

(II. By Sir Humphrey Davy. From the Journal of the Royal Institution.)

On the 18th of November, a paper, by James Smithson, esq., F. R. S., on the chemical analysis of some calamines, was read.

Much uncertainty has hitherto prevailed on the subject of the composition of calamines. The author was induced to carry on his researches by the hopes of obtaining a more certain knowledge of these ores, and he considers his results as fully proving the necessity for new investigations, and that the opinions which had been adopted concerning them were far removed from the truth. Mr. Smithson's experiments were made upon four different kinds of calamine: the calamine of Bleyberg, that of Somersetshire, that of Derbyshire, and the electrical calamine.

The calamine from Bleyberg was white, and had a stalactitical form; its specific gravity was 3.584. It became yellow under the blowpipe; and when exposed to the heat of the interior blue flame was gradually dissipated. It dissolved with effervescence in sulphuric acid, muriatic acid, and acetous acid. It lost by heat rather more than one-fourth of its weight. It afforded oxide of zinc, carbonic acid, and water, in the proportion of 714, 135, and 151; there was besides found in it a minute portion of the carbonates of lead and lime; but these the author considers as accidentally mixed with the ore, and not in combination with the other ingredients.

The calamine from Somersetshire was of a mammillated form. Its color was brown externally and greenish yellow internally; its specific gravity was 4.336. It dissolved in sulphuric acid, with effervescence: and when analyzed by means of reagents, afforded in 1,000 parts, 352 of carbonic acid, and 648 of oxide of zinc.

The Derbyshire calamine was in small crystals, of a pale yellow color; their specific gravity was 4.333. When analyzed, by solution in sulphuric acid, and the action of heat, 1,000 parts of them were found to contain, of carbonic acid 348, of oxide of zinc 652.

The electrical calamine, which Mr. Smithson examined, was from Regbania, in Hungary. It was in the form of regular crystals; the specific gravity of which was 3.434.

They became electrical by heat, and when exposed to the flame of the blowpipe decrepitated and shone with a green light. The electrical calamine differs materially in composition from the other specimens, in being formed chiefly of quartz and oxide of zinc, which, according to the author, are in chemical union. One thousand parts of it gave 250 parts of quartz, 683 of oxide of zinc, and 44 of water; the loss being 23 parts.

From his series of experiments on the calamines, Mr. Smithson has been able to deduce, with a considerable degree of accuracy, the composition of sulphate of zinc, which, when free from combined water, he considers as composed of equal parts of sulphuric acid and oxide of zinc.

In reasoning generally upon the constitution of salts of zinc, Mr. Smithson offers some new observations in relation to affinity; and he thinks that the proximate constituent parts of bodies are not absolutely united in the remote relations to each other, usually indicated by analyses, but that they are universally very considerable parts of the compound, probably seldom less than 2. He applies this theory in accounting for the presence of water in the calamine of Bleyberg, in which there is not sufficient carbonic acid to saturate the oxide of zinc; and he considers this ore as probably composed of a peculiar combination of water with the oxide of zinc, which he names hydrate of zinc, and of carbonate of zinc to each other in the proportions of 3 to 2.

All the calamines, when long exposed to the heat of the blowpipe, are dissipated, with the production of white flowers. This circumstance, the author thinks, ought not to be attributed to an immediate volatilization of the oxide of zinc, but rather to the deoxidation of this substance by the charcoal and combustible matter of the flame, and the consequent immediate sublimation and combustion of the metallic zinc, to which combustion the phosphorescence of calamines under the blowpipe may be owing.

The fibrous form of the flowers of zinc, produced during the action of the blowpipe upon calamine, Mr. Smithson attributes to the crystallization taking place during their mechanical suspension in the air; and he thinks that the fluid state is not at all necessary to the production of crystals, and that the only requisite for this operation is a freedom of motion in the masses which tend to unite, allowing them to obey that sort of polarity which occasions them to present to each other the parts adapted to mutual union.*

NOTE 5.

ILLUSTRATIONS OF PRESENTATION OF BOOKS BY SCIENTIFIC AUTHORS TO SMITHSON.

"Mr. Smithson. Hommage respectueux de l'auteur."
Nouveau système de minéralogie. Par J. J. Berzelius. Paris, 1819.

"Mr. Smithson. Hommage de l'auteur, Gay-Lussac."
Mémoire sur l'iode. 1814.

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* *Journal of the Royal Institution* of Great Britain, 1802, Vol. 1, p. 299.

"M. Smithson. From the translator."
Observations on the mineralogical and chemical history of the fossils of Cornwall. By M. H. Klaproth. Translated by Dr. John Gottlieb Groschke. London, 1787.

"M. Smithson. From the author."
Chemical account of various dropsical fluids. By Alex. Marcet. 1811.

"M. Smithson. From the author."
Letters to Sir Joseph Banks, president of the Royal Society, on the subject of cochineal insects discovered at Madras. By James Anderson, M. D. 1788.

"Mons. de Smithson. Hommage de l'auteur."
Mémoire sur la montagne de sel gemme de Cardonne en Espagne. Par P. Louis Cordier.

"À Mons. Smithson, de la Société royale de Londres. Hommage de l'auteur."
Observations sur la simplicité des lois auxquelles est soumise la structure des cristaux. Par M. Haüy.

"À Mons. de Smithson. Hommage de l'auteur."
Mémoire sur les substances minérales dites en masse qui entrent dans la composition des roches volcaniques. Par P. Louis Cordier.

"Mons. Smithson. De la part de l'auteur."
Mémoire sur les pierres météoriques. Par M. Fleurian de Bellevue. 1820.

"À Monsieur Smithson, amateur éclairé de la chimie et de la minéralogie. Hommage respectueux de l'auteur de cet opuscule, J. A. H. Lucas, membre des sociétés géologique de Londres et Wernerienne d'Edimbourg."
De la minéralogie. 1818.

"Mr. Smithson. From the author."
On some of the combinations of oxymuriatic gas and oxygene, and on the chemical relations of these principles to inflammable bodies. By Humphrey Davy, esq., LL. D. London, 1811.

NOTE 6.

APPRECIATION OF SMITHSON BY BERZELIUS.

Berzelius makes the following honorable mention of Smithson:

"Dans mon *Essai pour établir un système électro-chimique*, avec une nomenclature appropriée (Journal de Physique, Ann. 1811), j'ai fait mention des combinaisons de silice avec les autres oxides, comme de sels que j'ai nommés silicates. Il eût sans doute été prématuré alors d'essayer de diriger davantage l'attention vers les silicates minéralogiques, parce que le cahos où se trouvaient ces derniers eût servi plutôt à prévenir contre de pareilles idées, surtout comme la nature de ce traité ne comportait pas une exposition plus étendue du sujet. J'ai appris depuis, avec une vraie satisfaction, que M. SMITHSON, l'un des minéralogistes les plus expérimentés de l'Europe, sans avoir eu connaissance de mon Essai, a publié une idée semblable dans un Mémoire [Feb. 9, 1811] sur la nature de la natrolite et de la mésotype. On ne pourra disconvenir qu'une pareille coïncidence dérivée d'une part de la chimie seule, et de l'autre d'un point de vue d'analyse minéralogique, ne fournisse une preuve trèsforte de la justesse de l'idée, ce qui me fait espérer qu'aucun minéralogiste, au courant de l'état actuel de la chimie, ne conservera des doutes."[*]

Berzelius gives in his "Systematic enumeration of minerals": "*Zinc carbonate.* ZnC^2. Smithson, Phil. Trans., 1803, 17."[†]

Under *Zinc calamine*, he says:

"Nous devons la connaissance de la composition, tant des carbonates que du silicate de l'oxide de zinc, à un excellent travail de M. SMITHSON, inséré dans les Transact. phil., 1803."[‡]

NOTE 7.

EXTRACTS FROM SMITHSON'S WRITINGS.

The following extracts from Smithson's papers illustrate his breadth of view and style of composition:

"A knowledge of the productions of art, and of its operations, is indispensable to the geologist. Bold is the man who undertakes to assign effects to agents with which he has no acquaintance, which he never has beheld in action, to whose indisputable results he is an utter stranger, who engages in the fabrication of a world, alike unskilled in the forces and the materials which he employs."[§]

"More than commonly incurious must he be who would not find delight in stemming the stream of ages, returning to times long past, and beholding the then existing state of things and of men. In the arts of an ancient people much may be seen concerning them, the progress they had made in knowledge of various kinds, their habits, and their ideas on many subjects. And products of skill may likewise occur, either wholly unknown to us, or superior to those which now supply them.[‖]

"A want of due conviction that the materials of the globe and the products of the laboratory are the same, that what nature affords spontaneously to men, and what the art of the chemist prepares, differ no ways but in the sources from whence they are derived, has given to the industry of the collector of mineral bodies an erroneous direction."[¶]

"No observer of the earth can doubt that it has undergone very considerable changes. Its strata are everywhere broken and disordered, and in many of them are inclosed the remains of innumerable beings which once had life, and these beings appear to have been strangers to the climates in which their remains now exist. In a book held by a large portion of mankind to have been written from divine inspiration, an universal deluge is recorded. It was natural for the believers in this deluge to refer to its action all or many of the phenomena in question, and the more so as they seemed to find in them a corroboration of the event. Accordingly, this is what was done as soon as any desire to account for these appearances on the earth became felt. The success, however, was not such as to obtain the general assent of the learned; and the attempt fell into neglect and oblivion. . . .

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[*] *Nouveau système de minéralogie*, par J. J. Berzelius, Paris, 1819, p. 23.

[†] Same work; p. 205.

[‡] Same work; p. 255.

[§] On a fibrous metallic copper. *Smithsonian Miscell. Coll.*, No. 327, p. 70.

[‖] An examination of some Egyptian colors. *Smithsonian Miscell. Coll.*, No. 327, p. 101.

[¶] On some compounds of Fluorine. *Smithsonian Miscell. Coll.*, No. 327, p. 94.

"I have yielded to a sense of the importance of the subject in more than one respect, and of the uncertainty when I shall acquire ampler information at more voluminous sources—to a conviction that it is in his knowledge that man has found his greatness and his happiness, the high superiority which he holds over the other animals which inhabit the earth with him, and consequently that no ignorance is probably without loss to him, no error without evil, and that it is therefore preferable to urge unwarranted doubts, which can only occasion additional light to become elicited, than to risk by silence letting a question settle to rest, while any unsupported assumptions are involved in it." *

"We have no real knowledge of the nature of a compound substance until we are acquainted with its proximate elements, or those matters by whose direct or immediate union it is produced; for these only are its true elements. Thus, though we know that vegetable acids consist of oxygen, hydrogen, and carbon, we are not really acquainted with their composition, because these are not their proximate, that is, their true, elements, but are elements of their elements, or elements of these. It is evident what would be our acquaintance with sulphate of iron, for example, did we only know that a crystal of it consisted of iron, sulphur, oxygen, and hydrogen, or of carbonate of lime, if only that it was a compound of lime, carbon or diamond, and oxygen. In fact totally dissimilar substances may have the same ultimate elements, and even probably in precisely the same proportions; nitrate of ammonia and hydrate of ammonia or crystals of caustic volatile alkali, both ultimately consist of oxygen, hydrogen, and azote. . . . .

"It is evident that there must be a precise quantity in which the elements of compounds are united together in them; otherwise, a matter which was not a simple one would be liable, in its several masses, to vary from itself, according as one or other of its ingredients chanced to predominate. But chemical experiments are unavoidably attended with too many sources of fallacy for this precise quantity to be discovered by them; it is therefore to theory that we must owe the knowledge of it. For this purpose an hypothesis must be made and its justness tried by a strict comparison with facts. If they are found at variance, the assumed hypothesis must be relinquished with candor as erroneous; but should it, on the contrary, prove, on a multitude of trials, invariably to accord with the results of observation, as nearly as our means of determination authorize us to expect, we are warranted in believing that the principle of nature is obtained, as we then have all the proofs of its being so which men can have of the justness of their theories: a constant and perfect agreement with the phenomena, as far as can be discovered." †

"If the theory here advanced has any foundation in truth, the discovery will introduce a degree of rigorous accuracy and certainty into chemistry of which this science was thought to be ever incapable, by enabling the chemist, like the geometrician, to rectify by calculation the unavoidable errors of his manual operations, and by authorizing him to eliminate from the essential elements of a compound those products of its analysis whose quantity cannot be reduced to any admissible proportion. A certain knowledge of the exact proportions of the constituent principles of bodies may likewise open to our view harmonious analogies between the constitutions of related objects, general laws, &c.,

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* Observations on Penn's theory of the formation of the Kirkdale Cave. *Smithsonian Miscell. Coll.*, No. 327, pp. 103, 104.

† On the composition of the compound sulphuret from Huel Boys. *Smithsonian Miscell. Coll.*, No. 327, pp. 35, 37.

which at present totally escape us. In short, if it is founded in truth, its enabling the application of mathematics to chemistry cannot but be productive of material results."*

"The name imposed on a substance by the discoverer of it ought to be held in some degree sacred, and not altered without the most urgent necessity for doing it. It is but a feeble and just tribute of respect for the service which he has rendered to science."†

NOTE 8.

CATALOGUE OF THE LIBRARY OF JAMES SMITHSON.

Deposited in the Smithsonian Institution.

Anderson, Dr. James. Letters to Sir Joseph Banks, baronet, president of the Royal Society, on the subject of cochineal insects discovered at Madras. 26 pp. 8°. *Madras*, 1788.

Anderson, Dr. James. Letters on cochineal continued. 36 pp. 8°. *Madras*, 1789.

Anfrye et d'Arcet. Description d'un petit fourneau à coupelle. 48 pp. 8°. *Paris*, 1813.

Antilogies et fragmens philosophiques, etc. Tomes i–iv. 604, 592, 600, 600 pp. 12°. *Amsterdam*, 1774.

Baker, Henry. The microscope made easy. 340 pp. 8°. *London*, 1743.

Becquerel, A. C. Expériences sur le développement de l'électricité par la pression; lois de ce développement. 32 pp. 8°. *Paris*.

Becquerel, A. C. Sur les fils très-fins de platine et d'acier; et sur la distribution du magnétisme libre dans ces derniers. pp. 33–52. 8°. *Paris*.

Bellevue, Fleuriau de. Mémoire sur l'action du feu dans les volcans, ou sur divers rapports entre leurs produits, ceux de nos fourneaux, les météorites et les roches primitives. 62 pp. 4°. 1805.

Bellevue, Fleurian de. Mémoire sur les cristaux microscopiques, et en particulier sur la séméline, la mélite, la pseudo-sommite et le selce-Romano. 24 pp. 4°. *Paris*, 1798.

Bellevue, Fleurian de. Mémoire sur les pierres météoriques, et notamment sur celles tombées près de Jauzac, au mois de juin 1819. 24 pp. 4°. *Paris*, 1821.

Bergman, M. T. Opuscules chymiques et physiques. Tomes i, ii. 479, 513 pp. 8°. *Dijon*, 1780, 1785.

Berthoud, F. L'Art de régler les pendules et les montres. Quatrième édition. 126 pp. 12°. *Paris*, 1811.

Berzelius, J. J. De l'emploi du chalumeau dans les analyses chimiques et les déterminations minéralogiques. Traduit du Suédois, par F. Fresnel. 406 pp. 8°. *Paris*, 1821.

Berzelius, J. J. Nouveau système de minéralogie. Traduit du Suédois. 321 pp. 8°. *Paris*, 1819.

Bibliotheca Parisiana. A catalogue of a collection of books formed by a gentleman in France. 172 pp. 8°. *London*, 1791.

Bray, Wm. Sketch of a tour into Derbyshire and Yorkshire. Second edition. 408 pp. 8°. *London*, 1783.

Breve notiza di un viaggiatore sulle incrostazioni silicee termali d'Italia, e specialmente di quelle dei Campi Flegrei nel Regno di Napoli. 35 pp. 8°.

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* A chemical analysis of some Calamines. *Smithsonian Miscell. Coll.*, No. 327, p 29.

† On the composition of Zeolite. *Smitnsonian Miscell. Coll.*, No. 327, p. 45.

Bruxelles, Description de la ville de; enrichi du plan de la ville et de perspectives. 192 pp. 8°. *Bruxelles*, 1794.

Bullock, Wm. A descriptive catalogue of the exhibition entitled Ancient and Modern Mexico. 32 pp. 8°. *London.*

Camus, A. G. Voyage fait dans les départements nouvellement réunis. Tomes i, ii. 198, 229 pp. 24°. *Paris*, 1803.

Catalogue of gems in the collection of Mr. Findlay, Oriental Museum. 43 pp. 12°. *London*, 1802.

Catalogue des livres manuscrits et imprimés de la bibliothèque du feu M. F. A. Quetant. 11 pp. 8°. (Imperfect.) *Paris*, 1823.

Catalogue (A) of a splendid and most select collection of foreign minerals, which will be sold by auction by Mr. Thomas. 59 pp. 8°. *London*, 1826.

Catalogue of a valuable collection of minerals, the property of Mr. Heuland; to be sold at auction by Mr. Thomas. 27 pp. 8°. 1826.

Chambers, E. Cyclopædia, or an universal dictionary of arts and sciences, containing an explanation of the terms and an account of the several subjects in the liberal and mechanic arts, and the sciences, human and divine; with a supplement and modern improvements incorporated in one alphabet by A. Rees. Vols. i–v. Folio. *London*, 1795–1797.

Claubry, Henri François Gaultier. Recherches sur l'existence de l'iode dans l'eau de la mer et dans les plantes qui produisent la soude de varecs. 40 pp. 4°. *Paris*, 1815.

Conformité des coutumes des Indiens orientaux, par M. de la C. 268 pp. 12°. *Bruxelles*, 1704.

Constant, Benjamin de. De la doctrine politique qui peut réunir les partis en France. 43 pp. 8°. *Paris*, 1816.

Cookery, A new system of domestic, formed upon principles of economy and adapted to the use of private families. By a Lady. 375 pp. 8°. *London*, 1810.

Cordier, Louis. Mémoire sur la montagne de sel gemme de Cardonne en Espagne. 15 pp. 4°. *Paris*, 1816.

Cordier, Louis. Mémoire sur les substances minérales dites en masse qui entrent dans la composition des roches volcaniques de tous les âges. 87 pp. 4°.

Cronstedt, Axel F. An essay towards a system of mineralogy. Translated from the original Swedish, with notes by G. von Engestrom; to which is added a treatise on the pocket laboratory, containing an easy method, used by the author, for trying mineral bodies, written by the translator. The whole revised and corrected, with some additional notes, by E. M. Da Costa. 365 pp. 8°. *London*, 1770.

Cronstedt, Axel F. An essay towards a system of mineralogy. Translated from the Swedish, with annotations and an additional treatise on the blow-pipe, by Gustav Engestrom. Enlarged and improved by John Hyacinth de Magellan. Vols. i, ii. 1095 pp. 8°. *London*, 1788.

Davy, Humphrey. On some of the combinations of oxymuriatic gas and oxygene, and on the chemical relations of those principles to inflammable bodies. 35 pp. 4°. *London*, 1811.

Delamétherie, J. C. Leçons de minéralogie. Tomes i, ii. 572, 630 pp. 8°. *Paris*, 1812.

De l'Isle, Romé. Cristallographie, ou description des formes propres à tous les corps du règne minéral, dans l'état de combination saline, pierreuse ou métallique. Tome iv. 96 pp. 8°. *Paris*, 1783.

De l'Isle, Romé. Description méthodique d'une collection de minéraux du cabinet M. D. R. D. L. 336 pp. 8°. *Paris*, 1773.

Dhombres-Firmas, L. A. Nivellement barométrique du département du Gard. 33 pp. 8°. *Nismes*, 1811.

Dubois, C. M. Nouveau voyage de France, avec 24 itinéraires pour les différentes parties de l'empire. Tomes i, ii. 439, 501 pp. 12°. *Paris*, 1806.

[Dutens, L.] Mémoires d'un voyageur qui se repose, par M. L. D. Troisième édition. Tomes i–iii. 369, 329, 354 pp. 8°. *Londres*, 1807.

École d'enseignement mutuel de l'Eglise reformée de Paris. Rapport sur l'état de l'école au 31 décembre 1818. 25 pp. 12°. *Paris*, 1819.

Galignani's traveller's guide through Holland and Belgium. 410 pp. 32°. *Paris*, 1822.

Garnerin, Madame. A circumstantial account of the three last aërial voyages made by M. Garnerin. 36 pp. 12°. *London.*

Gaultier, L. Exercises sur la construction logique des phrases et des périodes contenues dans le texte des six premières époques de l'histoire universelle de Buffon. 60 pp. 24°. *Paris*, 1809.

Gay-Lussac. Mémoire sur l'iode. 160 pp. 8°. 1814.

[Glass, Mrs.] The art of cooking made plain and easy. By a Lady. New edition. 438 pp. 8°. *London*, 1770.

Gmelin, L. Indagationem chemicam pigmenti nigri oculorum taurinorum et vitulinorum adnexis quibusdam in id animadversionibus physiologicis. 72 pp. 12°. *Gœttingæ*, 1812.

Gmelin, L. Observationes oryctognosticæ et chemicæ de Hauyna, etc. 58 pp. 8°. *Heidelbergæ*, 1814.

Harriott, Lieut. J. Struggles through life, exemplified in the various travels and adventures in Europe, Asia, Africa, and America. Second edition. Vols. i, ii. 399, 366 pp. 8°. *London*, 1808.

Haüy, L'Abbé. Addition au mémoire sur l'Aragonite. 13 pp. 4°.

Haüy, L'Abbé. Observations sur la simplicité des lois auxquelles est soumise la structure des cristaux. 37 pp. 4°.

Haüy, L'Abbé. Tableau comparatif des résultats de la cristallographie et de l'analyse chimique, relativement à la classification des minéraux. 367 pp. 8°. *Paris*, 1809.

Histoire de Madame la Comtesse des Barres, à Madame la Marquise de Lambert. 140 pp. 32°. *Anvers*, 1735.

Instruction pour les voyageurs qui vont voir les glaciers et les Alpes du canton de Berne. 40 pp. 12°. *Berne*, 1787.

Johnson, Dr. Samuel. Works of, A new edition in twelve volumes, to which is prefixed an essay on his life and genius, by Arthur Murphy. Vols. i–xii. 8°. *London*, 1820.

Joseph, Don John, and Don Fausto de Luyart. A chemical analysis of wolfram, and examination of a new metal which enters into its composition. Translated from the Spanish by Charles Cullen. 67 pp. 8°. *London*, 1785.

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Klaproth, Martin Henry. Analytical essays towards promoting the chemical knowledge of mineral substances. Vols. i, ii. 607, 272 pp. 8°. *London*, 1801, 1804.

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La Harpe peint par lui-même. 222 pp. 24°. *Paris*, 1817.

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Lauzim, Mémoires de M. le Duc de. Deuxième édition. Tomes i, ii. 223, 200 pp. 32°. *Paris*, 1822.

Le Baillif. Mémoire sur l'emploi de petites coupelles au chalumeau ou nouveaux moyens d'essais minéralogiques. 24 pp. 8°. *Paris*, 1823.

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Logique, la, ou l'art de penser, contenant, outre les règles communes, plusieurs observations nouvelles propres à former le jugement. Nouvelle édition. 454 pp. 12°. *Paris*, 1816.

Londres (De) et ses environs. 127 pp. 8°. *Amsterdam*, 1789.

Lucas, J. A. H. De la minéralogie. 86 pp. 8°. *Paris*, 1818.

M———, Mons. de. Du développement à donner à quelques parties principales et essentielles de notre industrie intérieure et de l'affermissement de nos rapports commerciaux avec les pays étrangers. 59 pp. 8°. *Paris*, 1819.

Marcet, Dr. Alexander. A chemical account of various dropsical fluids. 42 pp. 8°. *London*, 1811.

Marchant, F. M. Le nouveau conducteur de l'étranger à Paris. 372 pp. 24°. *Paris*, 1816.

Margraf. Opusculus chymique. Tomes i, ii. 423, 459 pp. 12°. *Paris*, 1762.

Mercier. Mon bonnet de nuit. Tomes i, ii. 303, 307 pp. 12°. *Londres*, 1798.

Mexico. Description of a view of the City of Mexico and surrounding country, now exhibiting in the panorama, Leicester Square. 12 pp. 8°. *London*, 1826.

Meyer, D. L. A method of making useful mineral collections; to which are added some experiments on a deliquescent calcareous earth, or native fixed sal ammoniac. 31 pp. 8°. *London*, 1775.

Montague, Basil. Hanging not punishment enough. Printed in 1701; reprinted in 1812. 33 pp. 8°. *London*, 1812.

Monthly Review (The), or Literary Journal. Vols. i, iv, vi, vii, viii, xxii, xxiii, xxv, xxvii, xxxi, xxxv, xxxix, xlii, xliv, xlvii, l, lvii, lviii, lix, lx, lxiii, lxxi, lxxvi, lxxviii, lxxix, lxxxi, and index. 8°. *London*, 1790–1810. (Imperfect.)

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Nicholson, Wm. The first principles of chemistry. 564 pp. 8°. *London*, 1790.

Notice des tableaux exposés dans la Galerie du Musée royal. 2 copies. 244 pp. 12°. *Paris*, 1826.

Paris, Dr. John Ayrton. Memoir of the life and scientific labours of Rev. Wm. Gregor, A. M. 37 pp. 8°. *London*, 1818.

Philosophical Transactions of the Royal Society of London. 1811, part i; 1814, part ii; 1826, part i; 1827, parts i, ii. 4°. *London.*

Plain advice to the public to facilitate the making of their own wills; with forms of wills, simple and elaborate. 94 pp. 12°. *London*, 1826.

Platine (La), l'or blanc, ou le huitième métal. 215 pp. 12°. *Paris*, 1758.

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Pöllnitz, Baron de. Lettres et mémoires. Troisième édition. Tomes i, ii, iv, v. 420, 418, 488, 476 pp. 12°. *Amsterdam*, 1737.

Raab, Éléonore de. Catalogue méthodique et raisonné de la collection des fossiles, par M. de Born. Tomes i, ii. 546, 603 pp. 8°. *Vienne*, 1790.

Recherches sur la mythologie et la littérature du nord. 70 pp. 8°. *Paris*, 1820.

Recueil des mémoires les plus intéressants de chymie et d'histoire naturelle contenus dans les Actes de l'Académie d'Upsal et dans les Mémoires de l'Académie royale des sciences de Stockholm publiés depuis 1720 jusqu'en 1760. Traduits du Latin et de l'Allemand. Tomes i, ii. 699 pp. 12°. *Paris*, 1764.

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Rey, Jean. Dr. en médecine. Sur la recherche de la cause pour laquelle l'estain et le plomb augmentent de poids quand on les calcine. 144 pp. 12°. 1630.

Rostopchine, Comte. La vérité sur l'incendie de Moscou. 47 pp. 8°. *Paris*, 1823.

Rovigo, Duc de. Extrait des mémoires de M. le Duc de Rovigo concernant la catastrophe de M. le Duc d'Enghien. 68 pp. 8°. *Paris*, 1823.

Royal Armoury (Hay Market) Descriptive Catalogue. 16 pp. 8°. *London.*

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Sage, B. G. Précis des mémoires de Paris. 20 pp. 8°. 1809.

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Saulnier, fils. Notice sur le voyage de M. Lelorrain, en Égypte, et observations sur le zodiaque circulaire de Denderah. 97 pp. 8°. *Paris*, 1822.

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Voyage descriptive et philosophique de l'ancien et du nouveau Paris. Par L. P. Tome i. 314 pp. 24°. *Paris*, 1814.

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Winsor, F. A. Notice historique sur l'utilization du gaz hydrogène pour l'éclairage. 64 pp. 8°. *Paris*, 1816.

Wollaston, Wm. Hyde. A synoptic scale of chemical equivalents. 22 pp. 4°. *London*, 1814.

Wollaston, W. H. On the non-existence of sugar in the blood of persons laboring under diabetes mellitus. 16 pp. 4°. *London*, 1811.

Wolff, Jens. Runakefli le Runic Rim-stok, ou calendrier runique. 70 pp. 8°. *Paris*, 1820.

NOTE 9.

NOTICES OF THE CITY OF WASHINGTON, FOUND IN BOOKS IN SMITHSON'S LIBRARY.

One of the books in Smithson's library is "Struggles through life, exemplified in the various travels and adventures in Europe, Asia, Africa, and America. By Lieut. John Harriott." 8°. 2 vols. *London*, 1808.

Mr. Harriott (vol. ii, pp. 259–260) says:

"Respecting this intended city [Washington], I question much whether there ever will be a sufficient number of houses built to entitle it to the name of a great city. Reckoning up all the houses I could see or hear of as belonging to the new city of Washington, they did not amount to eighty. Having seen and examined everything, and gained all the information I could concerning this so much talked-of city, I sat down between the President's house and the Capitol, and entered the following in my minute-book, as my opinion, viz:

"Should the public buildings be completed, and enterprising individuals risk considerably in building houses; should the Union of the States continue undisturbed; should Congress assemble for a number of years, until the national bank and other public offices necessarily draw the moneyed interests to it, the city of Washington, in the course of a century, may form a focus of attraction to mercantile and trading people sufficient to make a beautiful commercial city deserving the name of its founder; but I apprehend so many hazards as to be most unwilling to venture any part of my property in the undertaking."

The other work in Smithson's library on America was by Isaac Weld, the Secretary of the Royal Society.

"Mr. Weld," says the London Monthly Review,* "feeling in common with the inhabitants of Europe the desolations of war, and trembling at the frightful progress of anarchy and confusion, was induced to cross the Atlantic for the purpose of examining into the truth of the various accounts which have been given of the flourishing condition of the United States."

Of Washington Mr. Weld remarks: "Were the houses that have been built situated in one place, all together, they would make a very respectable appearance, but scattered about as they are, a spectator can scarcely perceive anything like a town. Excepting the streets and avenues and a small part of the ground adjoining the public buildings, the whole place is covered with trees. To be under the necessity of going through a deep wood for one or two miles, perhaps, in order to see a next-door neighbor, and in the same city, is a curious and, I believe, a novel circumstance. . . . The number of inhabitants is 5,000. . . . The people who are opposed to the building of the city of Washington maintain that it can never become a town of any importance, and that all such as think to the contrary have been led astray by the representations of a few enthusiastic persons. . . . They insist that if the removal of the seat of government from Philadelphia should take place, a separation of the States will inevitably follow."

Notwithstanding the condition of the city of Washington at the beginning of the present century, Mr. Weld indulged hopes of its future greatness. He remarks:

"Considering the vastness of the territory which is opened to the Federal city by means of water communication, considering that it is capable from the fertility of its soil of maintaining three times the number of inhabitants that are to be found at present in all the United States, and that it is advancing at the present time more rapidly in population than any other part of the whole continent, there is good foundation for thinking that the Federal city, as soon as navigation is perfected, will increase most rapidly, and that at a future day, if the affairs of the United States go on as prosperously as they have done, it will become the grand emporium of the West, and rival in magnitude and splendor the cities of the whole world." †

This view was undoubtedly entertained by Smithson, and experience has shown how well-founded were his anticipations. The wisdom of his selection has been fully justified.

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* *Monthly Review* for September, 1799. London.

† Isaac Weld. *Travels through North America.* 1807. Vol. i, p. 80.

GENERAL APPENDIX

TO THE

SMITHSONIAN REPORT FOR 1879.

The object of this appendix is to illustrate the operations of the Institution, as well as to furnish information of a character suited especially to its correspondents and collaborators.

A STUDY OF THE SAVAGE WEAPONS AT THE CENTENNIAL EXHIBITION, PHILADELPHIA, 1876

By Edward H. Knight, A. M., LL. D.

INTRODUCTION.

The objects illustrated in the following paper are merely those of one class, shown at the Centennial Exhibition, in Philadelphia, 1876.

The paper, therefore, makes no pretense to completeness, as the weapons shown in the various national sections were in most cases treated as mere casual objects thrown in as curiosities, and in many cases so little esteemed by the parties in charge that they were huddled away under tables; surprise was sometimes expressed that any one should pore over the coarse and clumsy when the best talent of the country had exerted itself on the objects prominently displayed as worthy of notice.

More than 700 sketches of the crude and curious implements shown at the exhibition were made by the author; the following were a portion, including weapons only, while a much larger, embracing tools of industry, were the subject of a series of papers in the Atlantic Monthly, May, 1877, to April, 1878, inclusive.

There was no concurrence of design in the exhibition, so far as concerns our present subject. In almost all cases the objects were mere casual additions; in a few the scientific spirit was evident, and some care had been taken to illustrate this side of ethnology.

To illustrate: The curious collection of musical instruments and weapons brought by Capt. Long (Bey) from Central Africa was almost hidden in a corner, while the tufted carpets, embroidered robes, and horse-trappings were prominently shown. In the collection from Java and the other Dutch Colonies in the Malay seas, much more was shown of the appliances of the semi-savage races of the region. Brazil, which had so admirable a collection of its agricultural and forest products, had scarcely anything which touches our subject, and Japan had a great deal, though much less in the way of its weapons than in its industries and domestic implements.

The Centennial Exhibition was mainly of the means and results of modern industry and art, and the primitive objects were comparatively but strays and occasionals. It is, therefore, not the author's fault that the exhibit of the relatively rude is so incomplete, as he has rigidly confined his illustrations to objects actually exhibited there; and he is not responsible for the circumstance that the comparatively unknown and little thought of Portuguese colony of Angola had more in his line of search than the whole continent of South America.

It may be mentioned, however, that the Dutch and Portuguese colonies had a manifold better exhibit in Paris in 1878, and that the former had the finest ethnological display of the mechanical ingenuity of an unlettered people which it has ever been the good fortune of the author to see.

Types of Savage Weapons.—The simplest form of a weapon is a stick; a heavy stick is a club. The club with a knob becomes a mace; the swelling end sharpened on one edge is an axe. Point the stick and it is a spear; if light, it is a javelin; shorter still, it is a dagger for close quarters. Flatten the stick and give it an edge, it becomes a sword; or, if short, it is a knife.

So far the weapon is a single piece of wood; but some ingenious man contrives to mount a stone in a withe, or sling it with a thong or in the skin of an animal's leg, or lash it to a stick; or he learns how to project a light spear from a bow, or a heavier one by means of a stick or a thong. We find all these modifications in the collections from various countries at the Centennial.

Another type of weapon is the stone or club which is thrown; the simplest method is, of course, the mere hurling of stones by the hand. Then there are several forms of slings; the one having two thongs and a pocket, and the other a stick for hurling a perforated stone. The stone on the end of a string may be considered a third kind, and out of this grows the *bolas*—several associated balls on as many strings—which has a whirling motion when thrown. All of these also were exhibited. The lasso of South America naturally occurs to one in speaking of the *bolas*, though the noosed lasso belongs to another class of devices, not exactly a weapon but a snare.

Materials employed.—The statement of Lucretius (*De rerum naturæ*) in regard to the discovery of weapons relates rather to the material than the form. "The first weapons of mankind were the hands, nails, and teeth; also stones and branches of trees, the fragments of the woods; then flame and fire were used, as soon as they were known; and lastly was discovered the strength of iron and bronze. But the use of bronze was known earlier than that of iron, inasmuch as it is more easy to work and its abundance is greater." Bronze has greatly the antecedence of brass, the former being not less than a score of centuries the more ancient.

Brass is an accidental alloy, formed originally by melting cópper in contact with calamine stone (silicate of zinc), the practice, purely empiric, producing what was not known as an alloy, but as a bright copper, valued for its color and other qualities. Certain copper mines were valued as producing this gold-colored copper, but it was found out subsequently that by melting copper with a certain mineral (calamine) the same effect was produced. Aristotle, Strabo, and Albertus Magnus refer to an earth which conferred a yellow color on copper. Sulphate of zinc had a place in the pharmacopœia before its metallic base was known. The metal was discovered by that brilliant absurdity, Paracelsus, in the sixteenth century.

Bronze, on the contrary, has always been recognized as an alloy, being made by the fusing together of copper and tin in suitable proportions. It is found in those countries which possess both of these metals, and also in those ancient lands to which the Phœnicians penetrated. The Malay Islands and Cornwall furnished the tin of antiquity and that of to-day. Australia has also supplied it largely of late. The *kassiteros* (tin) of the Greeks gave its name to Cornwall and Scilly, the kassiterides of Herodotus.[1] It was the *kastera* of the Sanscrit, *kasdir* of the Arabs. The Javanese *tinah*, England *tin*, Swedish *tenn*, and Icelandic *den* mark the limits in either direction of the great traders of the earliest period of history. A bar of tin has been recovered from the Swiss lacustrine piles of Estavayer, molds for hatchets have been found at Morges, and remains of bronze foundries have been uncovered in the Canton of Vaud.[2]

Some of the ancient bronzes of England, Ireland, Scotland, and South America have notable proportions or traces of iron and of lead, and some of them have both of these metals in their composition. In the Roman bronze coins of Pompey, Hadrian, and Probus, zinc, iron, lead, and silver are found. One coin of Tacitus is of copper and iron. These are probably accidental impurities rather than intentional.

The lacustrine researches in the Swiss lakes have given rise to the classification of copper, tin, lead, and zinc as the *principal* ingredients of bronze, and silver, iron, antimony, nickel, and cobalt as *accidental*, and, it may almost be said, unsuspected. The Helvetian bronzes were destitute of lead, and the presence of zinc appears accidental. The use of calamine was common in the Levant, and lead was added to the bronze in notable quantities. In the bronze of the Swiss lakes the copper varied from 67 to 95 per cent., and the tin from 3 to 20 per cent (Desor). Sir John Lubbock remarks that lead and zinc are not found in the bronzes of the true bronze age.[3]

The iron of early ages, as well as that made by the native workmen of Asia and Africa at the present time, was obtained by a means analogous to that of the Catalan process. The fragments of rich iron ore are distributed through the mass of charcoal in the furnace, and by means of the bellows the fire is urged until the metal runs into a viscid ball, which is hammered to expel the dross, and the steel obtained by the single operation is purified and shaped by successive heatings and hammerings. An excellent quality is obtained, and native weapons were shown at the Centennial from India, Soudan, Angola, Mozambique,

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[1] Herodotus, iii, 115.

[2] Elisée Reclus, Smithsonian Report, 1861, p. 357.

[3] Sir John Lubbock's Introduction to Sven Nilson's "Stone Age," page xli.

Zululand, the Gold Coast, Borneo, and the Philippines; also, ancient bronzes from Egypt.

Copper, which may be held to have preceded bronze, was shown in the Indian relics from Wisconsin, and a modern fish-spear of an Alaskan tribe. Copper implements have been found in the lacustrine deposits at Peschiera on Lake Garda.[4]

TYPES OF WEAPONS DESCRIBED.

1. Clubs and throwing weapons.
2. Axes.
3. Knives and swords.
4. Spears.
5. Shields.
6. Bows and arrows.

I.—Clubs, and Throwing Weapons.

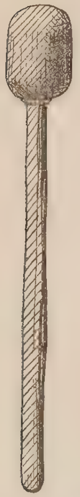

Fig. 1.—*Kafir Keerie. Cape of Good Hope.*

Leaving preambulation, let us begin at the Cape of Good Hope. The *Keerie* of the Kafir is his next best weapon after his favorite *assegai*, the native javelin; he does not use the bow and arrow. The *keerie*, called a *knob keerie* by the colonists at the Cape, is a hurling club, or is used in hand to hand encounters, but principally the former. It varies in length from 14 inches to 3 feet, but has been seen as much as six feet long.[5] It is straight and has a knob at the end. It is usually of acacia (*Acacia capensis*), but sometimes of strick wood (*Laurus bullata*). A more costly and highly prized material is rhinoceros horn, of which the *keerie* in the Cape of Good Hope exhibit (shown in the illustration) was made. The *keerie* is habitually carried, and is presented to a friend on meeting him; he touches it, and this is the etiquette of salutation. By a modification of the weapon, giving it a slight bend, it is used in ricochet, rebounding from the ground and striking upward.

The *knob keerie* of hard black wood is carried by the Bushman also.[6] The *pen bas* of the Bretons has been compared to it.[7]

Coming northward from Zululand we reach the Portuguese Possessions on the east coast of Africa, and find Mozambique weapons; these were shown, together with those from Angola, in the Agricultural Building at the Centennial. Fig. 2 represents two of them; one has a spear-shaped head, and the knob of the other resembles an ear of corn, or the *raceme* of a native plant common in the country. It suggests the idea of maize, but is made by longitudinally grooving, and then notching the protuberant ridges; a not unlikely style of ornamentation for a man to hit upon when amusing himself by carving his weapon. The clubs of the Dinkas of the Upper Nile[8] are also of hard wood made by ridging and notching so as to leave rows of knobs, like many of the Polynesian weapons. The form resembles the chocolate mullers we used to see, and also suggests the Roman mace *clausula*.

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[4] Morlot, transl. in Smithsonian Report, 1863, p. 373.

[5] Wood's "Natural History of Man," vol. i, p. 108.

[6] Baine's "South Africa," p. 363.

[7] See frontispiece to Trollope's "Walks in Brittany," 2 vols., London, 1840.

The club of the Dôrs of the Upper Nile[9] has been compared in shape to the mushroom, having a round disk-shaped head with a sharpened periphery. It is 30 inches in length and made of hard wood. The Djibba club has also a flattened head with a sharp edge, which is guarded by a sheath of hide when not in use. Another club in use in the last-mentioned tribe is champignon-shape, like an unexpanded mushroom. The King of Dahomey[10] is versatile in clubs; one favorite form has a knobbed end and four square knobs at the side; another has a long sharp spike at the end projecting at right angles from the handle.[11]

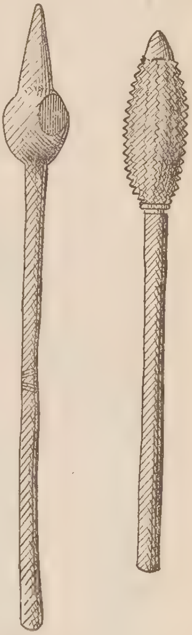

FIG. 2.—*Mozambique Clubs. Portuguese Colonies.*

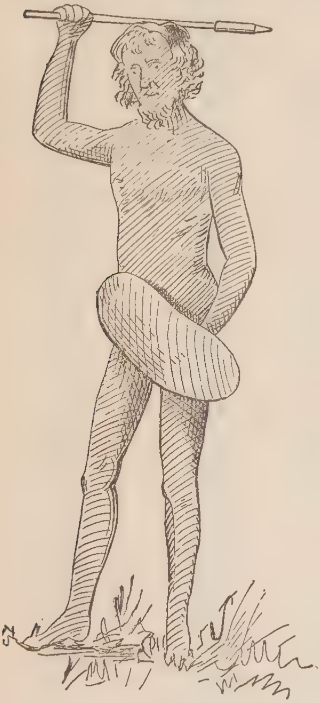

FIG. 3.—*Native Australian with club and shield, Queensland.*

A variety of sticks and clubs were brought from the different Australian provinces. The peculiar hurling weapons, the *boomerang* and *kangaroo rat*, will be considered presently. Fig. 3 is a Queensland native, armed with his *waddy* and shield. *Waddy* is a native name for a simple club, as shown in Fig. 3, and *b* and *d*, Fig. 4. The knobbed club is known as the *nulla-nulla*, and is shown in Fig. 5, and at *c*, Fig. 4. When the head is flat and sharpened to an edge, the colonists term them *tomahawks*, from their resemblance to the North American Indian weapon. Fig. 4 shows two wooden tomahawks (*a e*) of New South Wales,[12] a *nulla-nulla* (*c*), and two *waddies* (*b d*). The typical Australian *waddy* is 2 feet 8 inches long, weighs 2 pounds, and is made of the heavy and tough mountain tea-tree, box, or red gum wood. It has a pointed end so that its thrust is dangerous.[13]

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[8] Wood's "Natural History of Man," vol. i, p. 524.

[9] Wood's "Natural History of Man," i, p. 494.

[10] Duncan's "Western Africa," p. 226.

[11] The knob sticks of the Wanyamuezi are shown in Stanley's "Livingstone," plate opposite page 544.

[12] See the *li-bil*, R. Brough Smith's "Aborigines of Victoria," Fig. 97.

[13] Wood's "Natural History of Man," vol. ii, p. 29.

Some of them have four grooves extending from the point to the hand grasp, so that the wound is something like that made by a bayonet. Fig. 5 shows two *nulla-nullas* or hunting clubs from the southern part of the island, the colony of Victoria. They are two feet long.[14]

The *nulla-nulla* of the Lower Murray River is the *warra-warra* of the Yarra, and is made of a sapling of the mountain tea-tree, the enlargement at the root forming the knob. A pointed *nulla* is made by fashioning one of the projecting roots into a pointed spike, and is called *langeel*.[15] Sharp-edged wooden maces, which may be termed wooden swords, are also made by the Australian natives, some weighing as high as 41 ounces.[16]

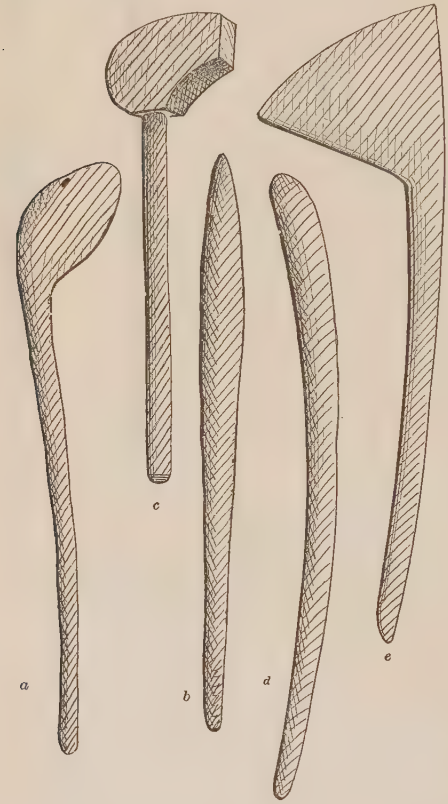

Fig. 4.—*Australian wooden weapons, New South Wales.*

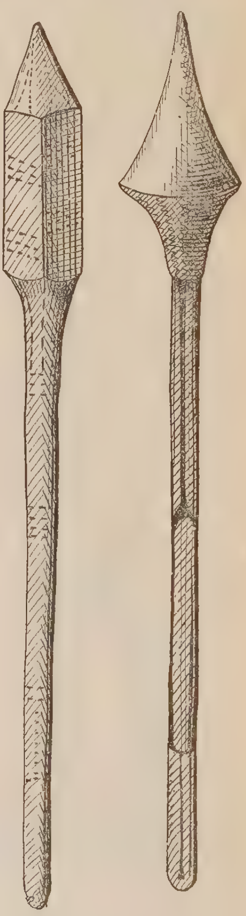

Fig. 5.—*Australian nulla-nullas, Victoria.*

Crossing to New Zealand, we find the Maories to have a much greater variety of material and of shape. The most prized material is the green jade, and it is also wrought with the greatest difficulty. The bone of whale bears a medium character in both respects. Fig. 6 shows two forms of Maori wooden clubs, known as *pátu;* one has a sharp edge to the axe-like head, and a bunch of feathers intended to shake in the face of an enemy and disturb his aim. The weapon to the right is paddle-shaped, and has two edges; a not uncommon form in Polynesia.

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[14] R. B. Smith's "Aborigines of Victoria," vol. i, 299–300, Figs. 56–59.

[15] *Ibid.*, Fig. 62.

[16] *Ibid.*, Figs. 60, 66, 67; see also Figs. 61, 65.

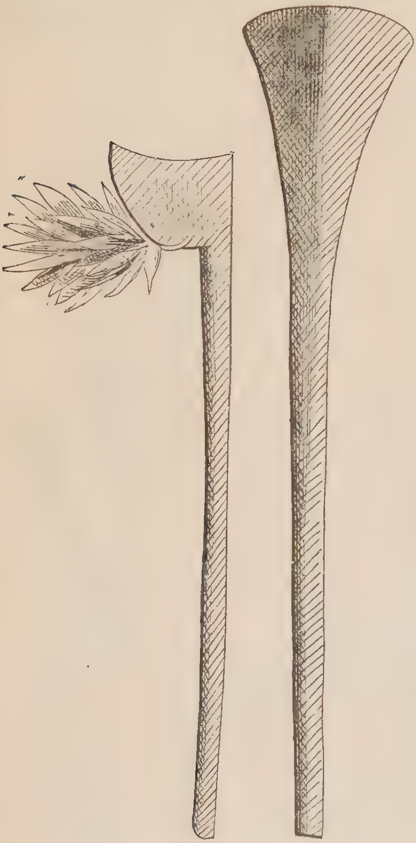

FIG. 6.—*Wooden clubs, New Zealand.*

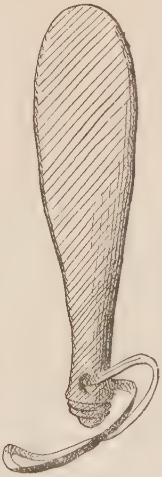

FIG. 7.—*Stone merai, New Zealand.*

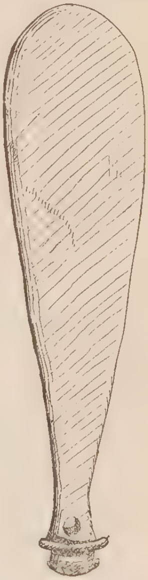

FIG. 8.—*Green-stone merai, New Zealand.*

The *merai* or *pátu-pátu* of New Zealand is a two-edged club of a prolonged ovoidal shape. It usually has a hole in the neck for a wrist-cord. Fig. 7 is of green jade, very symmetrical, and beautifully polished with a species of corundum found in the island. Fig. 8 is of stone, and is also carefully made and polished. Such weapons become heir-looms in families, and possess names, much as in former times titles were given to swords, as, for instance, *Samsamah*, the cimeter of Haroun al Raschid, and *Excalibar*, the sword of King Arthur. The stone *merai*, Fig. 8, was called *Kororaki.* Fig. 9 is a stone weapon called *Pátu Kohatu;* its wrist-thong occupies a circular depression. Fig. 10 is a carved weapon, the name of which was *Kaikanohi*, or "face-eater." It is made from a bone of a spermaceti whale, and has the reputation of having been handed down in the family for twelve generations. *Merais* of this shape are also made of wood, but are not as much valued as those of harder and more enduring materials.

It had been supposed that the "flattened soda-water-bottle shape," as Tylor has called it, was peculiar to this ingenious cannibal race, the antipodes of the British, but it appears that the Peruvians make a weapon of exactly similar shape; one has been found of dark brown jasper,[17] and another of a greenish amphibolic stone.[18] Another of native copper has been found in Michigan, and was shown at the Centennial. It is 16¼ inches long, 2⅝ inches wide for 11 inches of its length, contracts to 1½ inch, and then enlarges to 2 inches, to assist the hand-grasp. No deduction of importance is to be made from this; the blade is but 1⅛ inch wider than the handle, and the probability is that the piece of native copper approximated that shape, the work of the owner consisting in flattening, sharpening, and shaping it symmetrically.

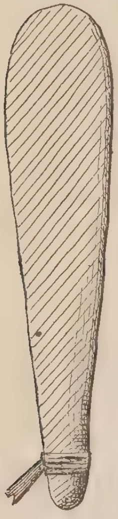
FIG. 9.—*Maori Pátu Kohatu,* *New Zealand.*

Crossing the Southern Ocean we reach the Fiji Islands, lately come into the possession of Great Britain. The Fijian is a Papuan race, and remarkable for constructive ability. The club is his great weapon, and upon it he expends his lavish carving, the implements being of various sizes and patterns, the handiwork being all guided by individual taste.[19] The display at the Centennial was not large, the islands not being specially represented. The classification of their clubs into large, small, knobbed, bladed, axe-shaped, straight, or curved gives but a faint idea of the variety. The *dromo* is a spiked mace, and resembles some of the North American Indian clubs. The *dui* is like the double Phrygian axe. The *totokea* is a spiked hammer.[20] The stem of a small tree, with a swelling bole, and the radiating roots trimmed as projecting knobs, is a common style. Another form is made by bending over a young sapling nearly to the ground, so as to bring the tap-root at right angles to the stem. When the tree has sufficiently grown, it is cut and shaped, and the tap-root forms a laterally-projecting knob with a circle of spikes formed of the other roots, shortened and sharpened. Other clubs are like maces; squared and notched; with pyramidal or mushroom tops; ornamented with braided *coir*, with wicker-work, with feathers worked in with *sinnet*, inlaid with shell, bone, hog's tusks, human or whale's teeth.[21]

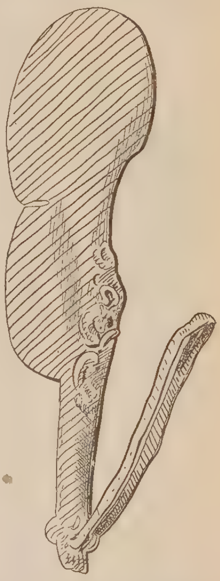
FIG. 10.—*Kakati Weapon* (*bone of whale*), *New Zealand.*

We miss clubs when we come to lands where the more deadly metal is abundant. Java has, however, two clubs deemed worthy of special names, *Indan* and *Gada*.[22] The "war-fan" of the Japanese is perhaps unique, being of large size and having a sheath of iron so that it may do duty as a club on emergency.

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[17] Klemm, C. N., part ii, page 26.

[18] Rivero & Tschudi.? Plates, pl. xxxiii.

[19] Smythe's "Ten Months in Fiji," p. 120.

[20] Williams, "Fiji," pp. 43–4; 589.

[21] Wood, vol. ii, p. 275.

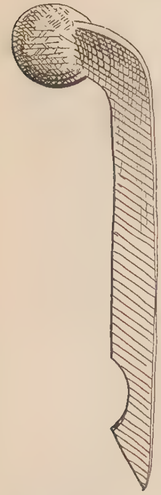

FIG. 11.—*Ojibeway wooden club, Canada.*

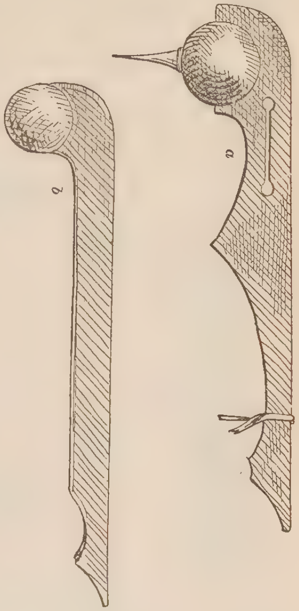

FIG. 12.—*Wooden clubs of Dakotah.—National Museum.*

Coming to America we find a greater variety, if possible, than Fiji furnishes, for those astute islanders have but a meager choice of materials—wood and shell. Fig. 11 is an Ojibeway war-club from Sagamook, on the north shore of Lake Huron. Fig. 12 shows two wooden clubs, one armed with an iron spike; they are from the Missouri Valley Indians. Spiked weapons have always been in vogue, and a curious example of one is a stag's-horn club with the brow antler left as a spike, found in one of the Swiss Lakes. See memoir by M. E. Desor.[23] Stag's-horn hammers are also very numerous in the *debris* of the lake dwellings. A hammer of serpentine with inserted helve and with a hammering face and pointed peen is mentioned by Nilson.[24] Many other forms are found among the Indian tribes, but the aim has been to place together the wooden clubs made in a single piece. Those in which stones or metal are mounted will be shown presently. Fig. 13 is a pestle-shaped war-club of the Pai-Utes and Mohaves. They are termed "face mashers," since they are carried concealed about the person and used for striking an enemy in the face.

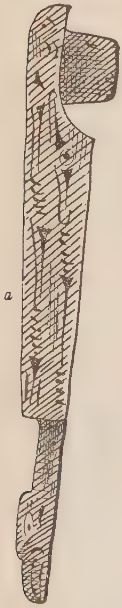

FIG. 14.—*Haidah war-club.—National Museum.*

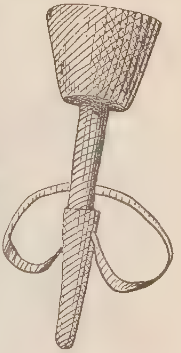

FIG. 13.—*Pai-Ute club.—National Museum.*

Figs. 14 and 15 are from the Pacific Coast. They are elaborately carved war-clubs of hard wood from the Haidah Indians of Bella-bella, British Columbia. They are what we should call "grotesquely carved," but the emblems on them are mythological, and the idea of pleasantry does not, we are informed, enter into the work. The canoes, totem-posts, paddles, bowls, and other objects fashioned in wood, exhibit the same style of ornamentation, as it must be called.

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[22] Sir Stamford Raffles' "Java," 4to ed., i, 296 (Figs. 8, 9).

[23] Translation in Smithsonian Report, 1865, page 357.

[24] Ibid., page 359.

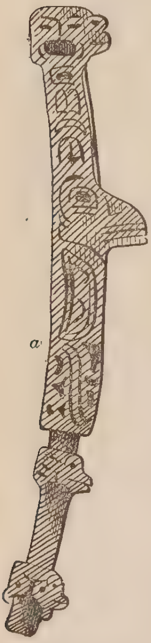

FIG. 15.—*Haidah carved war-club.—National Museum.*

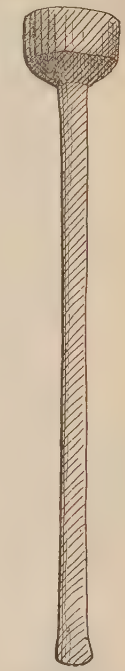

FIG. 16.—*Mace from Paraguay, Argentine Confederation.*

The Argentine Republic sent a mace, which is shown at Fig. 16. It is of hard wood resembling *lignum vitæ*, and is 48 inches long. It belonged to an Indian of the pampas. A spear eight feet long, of the same kind of wood and tapering to a point, was exhibited with it. The club of the Gran Chaco Indians[25] of the La Plata region is square in section, larger towards each end, and is grasped in the middle. It is called a *macana*, and is used either as a hurling weapon or as a club at close quarters. The clubs of the Guiana Indians are maces of square section, or paddle-shaped with somewhat sharp edges. The handles are embroidered with cotton string, some in a very ornamental manner. The Uaupé Indians of the Amazon[26] also use carved wooden clubs.

We come now to a class of clubs in which a stone is mounted upon a withe or other kind of handle to form a maul or hammer. We do not in the present article consider those which have sharp edges, and are designed to form axes and adzes. They will be grouped separately. Fig. 17 is about as primitive an affair as can well be devised. It is a shell-headed club from a shell-heap on Saint John's River, Florida. The head is a *Pyrula*, and the specimen is peculiar in this, that though ancient it still has the remains of the original handle.

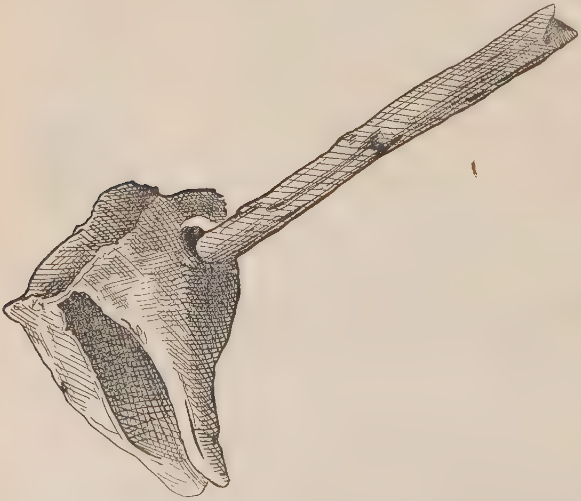

FIG. 17.—*Shell-headed club from a Florida shell-heap.—National Museum.*

In connection with this method of mounting, by a perforated head through which the helve is thrust, mention may be made of hammer stones, sometimes known as helved wedges, similarly handled, and which have been hurling axes. They are more frequent in Europe than in America. Some of these have their edges in line with the handle and some across it, as axes and adzes respectively. See Sven Nilson's "Stone Age,"[27] edited by Sir John Lubbock. A remarkable four-pronged stone battle-axe is shown in the museum of Lund, Sweden, having a diameter of 8 inches, and perforated for a handle.[28]

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[25] Wood, vol. ii, pp. 569, 570.

[26] Wallace's "Amazon," 504.

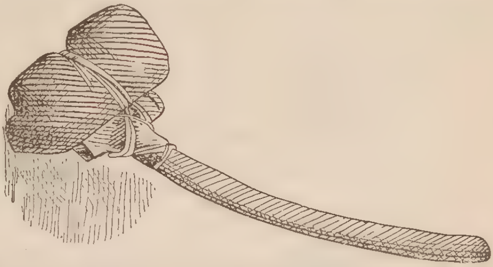
FIG. 18.—*Stone maul, from British Columbia.—National Museum.*

Fig. 18 is a stone maul lashed with raw-hide thongs to a T-shaped handle which has been formed from a forked branch. It is from the Haidah Indians, Bellabella, British Columbia. Fig. 19 is a large stone maul lashed to a short handle formed of a forked limb. It is from Sitka, Alaska. Fig. 20 is from New Zealand. It shows that a similar mode of mounting is practiced by the Maories, the bowlder being secured in the crotch by means of thongs. The pursuit of similar examples leads us a devious dance. We find that the Gran Chaco Indians, of South America, have a peculiar method of embedding a cylindrical stone in a club so that it may project like an axe blade. A hole is bored into a sapling of suitable size and the stone driven in. As the tree grows, the wood advances upon the stone and grips it firmly. The sapling is then cut and shaped.

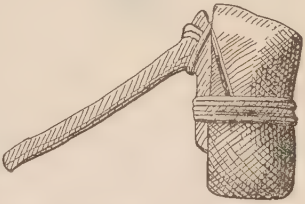
FIG. 19.—*Stone maul, of Alaska.—National Museum.*

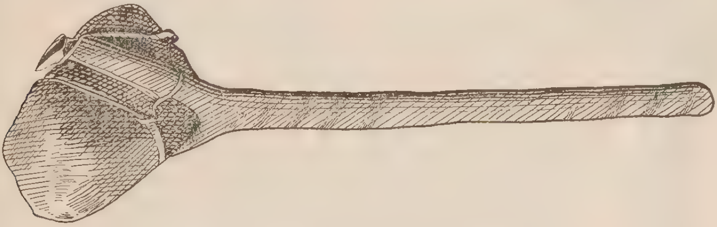
FIG. 20.—*Maori stone club, New Zealand.*

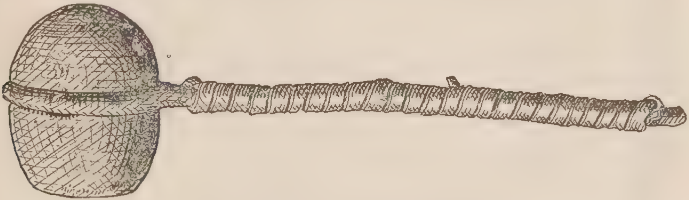
FIG. 21.—*Stone maul of Arickarees.*

Fig. 21 is a stone maul of the Arickaree Indians of the Upper Missouri River.[29] It is a reddish, granite pebble of three and a half pounds weight. The withe is bent around it, occupying a circumferential depression, which is interrupted opposite the handle. The same kind of hammer was used by the native workmen formerly in the Lake Superior copper mines. It is used by the Missouri Indians in driving stakes and tent-pegs.

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[27] Page 72, and plate ix, Figs. 183, 184; pp. 73, 74; and plate viii, Figs. 180, 181.

[28] Ibid., page 75, and pl. ix, Fig. 159.

[29] See "Twenty-first Report of N. Y. State Cabinet," pp. 31–36, pls. i, ii, iii.

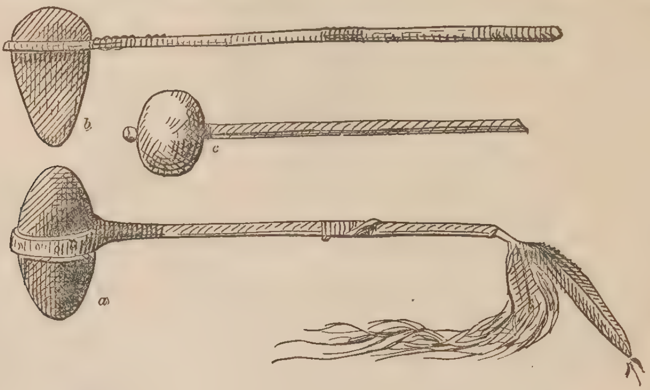

FIG. 22.—*Stone mauls of Missouri Valley Indians.—National Museum.*

Fig. 22 shows two stone implements of the Sioux, the hereditary enemies of the tribe last mentioned. The upper one is a rude grooved axe mounted in a hickory sapling, the two ends of which are brought together with raw-hide thongs to form the handle. The lower figure is a war-club with an egg-shaped limestone head and a handle of ash; the end of the latter is ornamented with the tuft from the tail of a buffalo. Between the two figures is a representation of the Roman sacrificial *malleus*, which, even in the time of the emperors, was employed in slaughtering the victims. It seems to have come down from times then ancient, the order of procedure admitting of no innovation, just as the knives of flint were used in ancient Egypt and among the Hebrews in performing ceremonial observances and sacrifices. Dr. Schliemann found hundreds of rude stone hammers in the hill of Hissarlik.

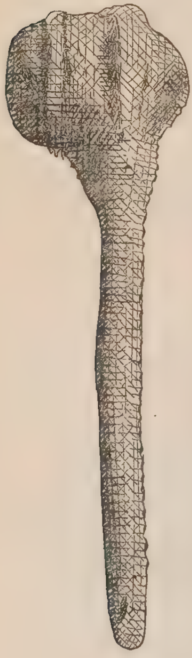

FIG. 23.—*Arickaree stone maul.*

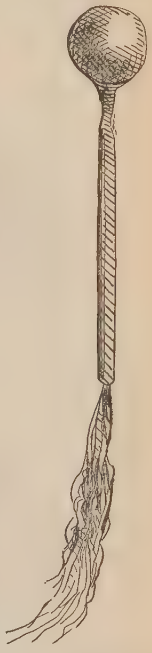

FIG. 24.—*War-club of Apaches, Arizona.—National Museum.*

Another mode of mounting a large pebble or wedge-shaped stone is by means of a raw-hide covering to the stone and withe.

Fig. 23 shows an Arickaree weapon made in this manner: The granite pebble weighing 22 ounces is grooved circumferentially and a withe bent around it and secured by raw-hide thongs next to the stone. Over the whole of the stone and handle, except the hammer face, a single piece of wet buffalo hide is stretched and sewed with sinew. When the hide shrinks in drying the whole forms a very firm job. The use of a similar tool in driving stakes and tent-pins has been mentioned, but there are many other purposes about an Indian camp, such as breaking bones and pounding pemmican, for which it is well adapted, not to mention the warlike uses.

The *poggamoggon* of the Shoshones is a slungshot.

Fig. 24 shows yet another mode of mounting the stone. The pebble and the withe are covered with the tail skin of a buffalo, the tuft of hair remaining. It resembles the slungshot used nearer home, or the stone in a stocking foot, said to be a favorite with the gentler sex in some places.

Hammer-axes of stone and horn, bored for the helve, are to be found in many museums. See Nilson.[30]

We will now examine the throwing weapons; premising that neither law nor custom prevents the hurling of some already described. The Fijian among the abundance of his clubs has one specially for throwing; it is knobbed at the end like the Kafir *keerie* and is worn in the girdle, sometimes in pairs like pistols. Fig. 25 is the throwing-stick of Uganda brought by Capt. Long (Bey) from his expedition south of Khartoom. It is three feet long, has a spear-shaped head, and is hurled with a whirling motion somewhat in the manner of the Australian *boomerang*, but without the peculiar erratic flight of the latter.

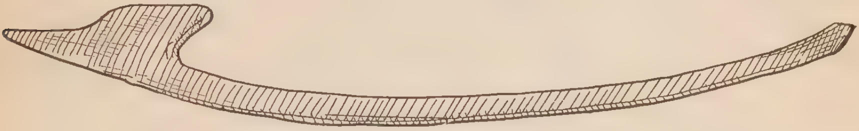

FIG. 25.—*Throwing-stick of Uganda, Africa.—Egyptian Exhibit.*

The curved throwing-stick was also noticed by Sir Samuel Baker in Abyssinia, and is common among the negroes as far west as Lake Tsad. The *Es-sellem* of the desert[31] is like the curved sticks of the ancient Egyptians[32] and closely resembles the middle stick in Fig. 28.

The *trumbash* or throwing-stick of the Niam-niams of the Upper Nile[33] is a flat projectile used for killing birds or hares, and is carried inside the shield. The war weapon when made of iron is called *kulbeda*, and has three projecting limbs with pointed prongs and sharp edges, the longer blade at right angles to the grip, which is guarded by the shortest prong of the three. This wicked weapon is spun about its axis and has a movement of translation in a horizontal plane. It is also a hacking hand-to-hand weapon. Somewhat similar weapons with two blades are found in upper Sennaar and Central Soudan, and are used by the Fans. The *keerie* or knobbed throwing-stick of the Kafirs has been already described. The *lissan* is the curved throwing-stick of another African tribe; the iron *hungamunga*[34] of the Tibbus and of Darfur is also a hurling weapon.[35]

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[30] "Stone Age" Pl. viii, Figs. 168–179.

[31] Smith's "Aborigines of Victoria," Discussion on, pp. 321 *et seq.*, vol. i.

[32] Ibid (note *passim*), i, 299.

[33] Schweinfurth.

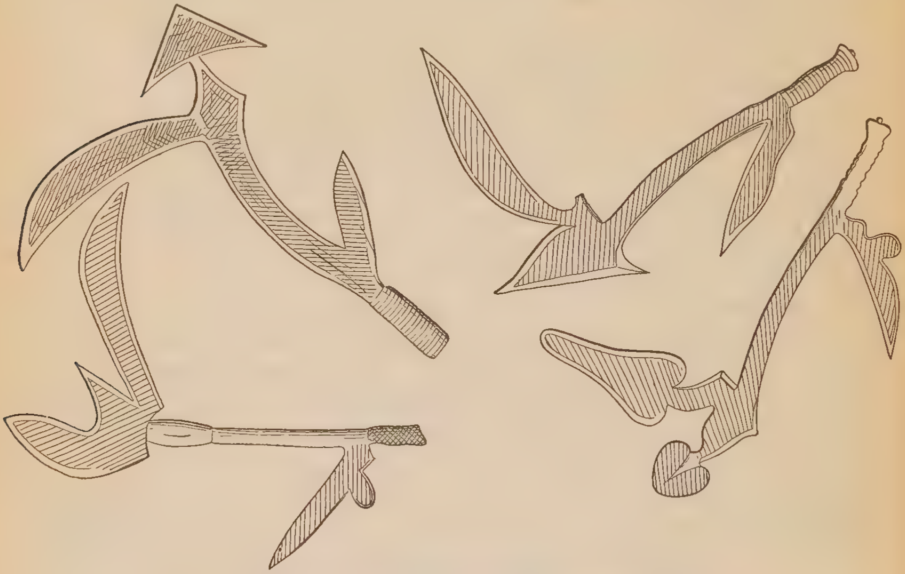

FIG. 26.—*Niam-niam hurling-weapons* (*trumbash*).

It would be singular, indeed, if a cudgel for throwing at game were found in but one part of the world, and at but one period; but the discovery of the Australian *boomerang*, the most curious of its class, has directed attention to what might otherwise have been passed over as unimportant. The Egyptian and Assyrian monuments have been consulted, and in each case the curved stick has been noticed in the hands of bird-catchers or hunters. An ancient throwing-stick about eighteen inches long is in the Abbott Egyptian collection of the New York Historical Society. A short, crooked stick (*pedum*) was used by the Romans to throw at hares, and centaurs are represented with a short *pedum* (λἄγωβόλον) in the other.

In coming to Australia we reach a people living in an almost primitive condition, so low, ill-formed, and ignorant that their name has become a synonym for imbecility. Here, however, the throwing-stick has attained its highest development. The maximum of improvement has not, however, been reached by the natives of all parts of this island, which is almost as large as the United States and Territories. The *boomerang* (Fig. 27), used with such singular dexterity by the "black fellows" of New South Wales, is almost unknown to those of the colony of South Australia, which, by the bye, is not the most southerly portion of the island, that position being occupied by the thriving colony of Victoria. The boomerang is, however, used in Western Australia, where it is called a *ky-lie*. This is a true return-boomerang.[36] Even in the districts where the *boomerang* is used there are all grades of throwing-sticks, three of which of different forms were in the New South Wales exhibit, and are shown in Fig. 28. The upper one is carved with raised serpentine figures, the stick being painted red in the intervals. With these weapons the natives give a direct blow, a whirling blow, or a ricochet upward-rebounding blow.

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[34] Illustrated in the discussion on the boomerang. Smith, "Abor. Victoria," 321 *et seq.*

[35] Tyler's "Early History of Mankind," 175–6. See also paper by Ferguson in Trans. R. I. A. Dublin, 1843, vol. xix. Paper by W. Cooke Taylor. The Nat. Hist. Soc. London, 1840, vol. i, page 205; Eyre, vol. ii, p. 308; Klemm, C. G. vol. i, p. 316, plate vii.

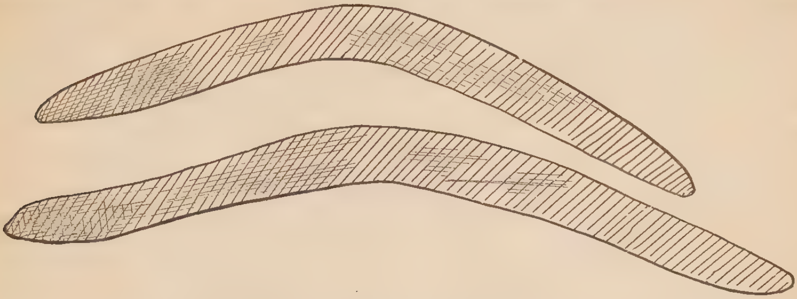

FIG. 27.—*Boomerangs of New South Wales.*

The *boomerang* is made of the wood of the blue gum (*Eucalyptus globulus*), or sometimes from the iron-bark of the she-oak, and is of flatted curved shape, convex on the upper surface and flat below, always thickest in the middle, from which it is scraped away towards both edges, which are tolerably sharp, especially the outer one. *Boomerangs* vary much in shape, but do not depart from the characteristics mentioned. They differ in their curves, lengths, widths, taper, and weight.

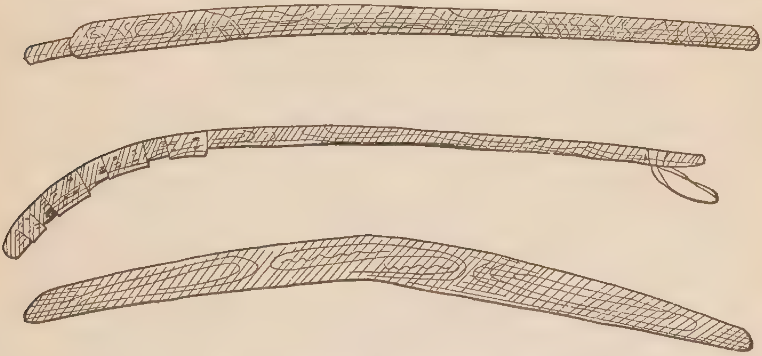

FIG. 28.—*Australian throwing-sticks, Victoria.*

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[36] Aborigines of Victoria, vol. i, 336, Fig. 140.

A good specimen may be 33 inches from tip to tip measured along the curve, 2 inches wide, and weigh 12 ounces. There are several ways of throwing the boomerang so as to make it execute its peculiar evolutions. In throwing it, the native grasps it by the handle end, which has some notches upon it, and holds the flat side downward; then balancing it a moment in his hand, and making a few quick steps forward, he launches it with a sharp fling, bringing his hand back so as to make it revolve in the plane of its curve with great rapidity. The peculiarity of the boomerang is in what may be considered its erratic flight. Thrown so as to strike the ground 40 yards in advance of the thrower, it rebounds, describes a high circular backward course, and falls behind the thrower. Thrown high in the air it mounts to a great height, circles backward until its force is expended, and then drops dead at a point behind the thrower. It is also thrown, so as at a given distance to make its rebound in other than an upward circular direction, and curve its flight around an object so as to strike something behind the latter. This is merely an effort of skill. The *boomerang* is thrown against the wind; and, though it is easy enough to hurl it, it is very difficult to make it perform at command all the peculiar evolutions which distinguish it. It is roughly made, so far as mere finish is concerned; but the work upon it in adjusting the curves is most scrupulously and patiently performed by the natives, some of whom never acquire proficiency, while others become celebrated for their skill in the manufacture of the weapon. Like all instruments which have attained something like perfection, the difference between the best and poorest is greater than in the case of some other tools where a more general level of excellence is preserved.

The subject of the *boomerang* has been learnedly and carefully considered in R. Brough Smith's "Aborigines of Victoria."[37] The discussion has elicited the fact that some throwing-sticks move with a spinning or whirling motion, and even pursue a curved path, as a billiard or baseball player can curve the trajectory by imparting rotation to the ball. None of the implements, however, described by Col. Lane Fox (British Association, 1872), or referred to in Mr. Ferguson's learned paper before the Royal Irish Academy in 1838, are fairly comparable to the Australian weapon. It must also be remarked that the distinction between the play weapon and the war weapon is clearly drawn in the mind of the native, though the back-return boomerang cannot always be distinguished from the war boomerang by a novice. The *barnyeet* of the Yarra,[38] for instance, is a war weapon, and not a come-back; nor is it so much curved as the regular boomerang, *wonguim*.[39] A group of the various kinds is shown in Mr. Smith's work, previously referred to.[40]

From the straight round stick, knobbed stick, flat stick, curved stick, edged curved stick (a wooden sword), through every degree of curvature up to the perfect boomerang, the series of Australian hurling weapons occupies the whole ground. The most curiously-curved weapon, which should not be omitted, is the *quirriang-an-wun*, impossible to explain without an illustration, and not shown in Philadelphia. It is a thin flake of wood, curiously twisted and curved.[41]

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[37] Vol. i, p. 321, *et seq.* [38] *Ibid.*, Fig. 96. [39] *Ibid.*, Fig. 95. [40] *Ibid.*, i, 315, Fig. 99.

Fig. 29 shows, for purposes of comparison, an Australian *boomerang* (*a*) from Murray River, and a curved throwing-stick (*b*) used by the Moqui and Shimmo Indians in killing rabbits. These throwing-sticks, though curved so as to resemble in one important respect the Australian weapon, cannot, like it, be made to describe the peculiar divergent curved course through the air. These sticks were formerly used by many of the Southern California tribes.

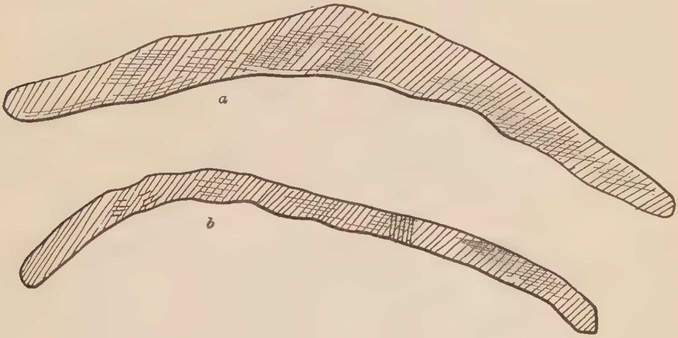

FIG. 29.—*Boomerang and Moqui throwing-stick.*

The *kangaroo rat* (*weet-weet*),[42] Fig. 30, of the Australians has been sometimes spoken of as rather a toy than a weapon, but it is a dangerous missile. Its head is usually a piece of hard wood, of a conoidal or double conical shape, and its tail is a flexible handle a yard long. By this handle it is thrown; the native takes the *rat* by the *tail* and swings it back and forth several times, bending it almost double. Suddenly letting it fly by an underhand jerk, it glides hissing through the air, striking and rebounding like a flat stone skimming the surface of the water—the familiar "ducks and drakes" of our childhood. It does not rise more than nine feet above the surface of the ground, and the distance it reaches depends upon the force of the projection and also upon the angle at which it first strikes the surface of the earth. If the trajectory be too high, it makes a number of high leaps and soon tires; if too low, the force is soon expended in friction on the ground. The body with a trailing tail making flying leaps has much the appearance of a small

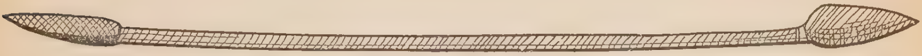

FIG. 30.—*Kangaroo rat, South Australia.*

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[41] *Ibid.*, i, 315, Fig. 315.

[42] Wood, ii, p. 41.

kangaroo, and is well named the *kangaroo rat*. The example illustrated is of wild buffalo horn, heated and pressed to shape.

The kangaroo rat described by R. Brough Smith is about 26 inches long, the tail being 21 inches and the head 4.5 inches.[43]

Something like the kangaroo rat of the Australians is a missile employed in a game of the Fijians.[44] A reed four feet in length terminates in an ovoid piece of hard and heavy wood six inches long. It is held between the thumb and finger and thrown by an underhand jerk, so as to skim horizontally over the ground. A long smooth stretch of turf is kept in good order in the villages for this purpose. This suggests the pitching of quoits and horseshoes, curling stones, hockey, polo, and other ball games, which we merely suggest as we pass, supposing them not to be distinctly savage, though some of them are athletic survivals of ancient barbaric exercises.

The *chakra*[45] or "quoit weapon" of the Sikhs is savage enough to be worth a mention. It is an annular disk of thin steel with a sharp edge all round. It is whirled upon the fore-finger and then thrown, spinning as it flies, and is a formidable weapon when aimed at the face of an enemy, several being hurled in rapid succession and with great force. They can also give it a ricochet flight.

A similar weapon has been brought from Guatemala by M. Boursier, the French Consul. It is disk-shaped, very sharp on the edges, and about 6 inches in diameter. Hurling-disks have been found also in Brittany and Central France.

The Peruvian hurling-disk is of diorite with a central opening 1 inch in diameter and 10 circumferential teeth 2 inches long. It is thrown by aid of a thong like the bolus. The Mexicans have a similar weapon[46] and the Australians a crude affair of the same general idea.

From this cutting disk whirled by the finger we reach by a single step the simple pebble which is hurled by hand. We began with a stick, and after considering the club simple and compound, and the various forms of throwing clubs, have come to simple missiles—the pebble or small bowlder. Some tribes, however, are not content with the stones of the brook, but shape the projectile; the Tahitians,[47] for instance, make oval balls of stalagmite, which they hurl by hand with force and accuracy, not using a sling. The Fuegians, although very skillful with the sling, are adepts at hurling stones by hand.

Incendiary balls were used by the Nervii, who fired the camp of Cæsar, and the balls of charcoal kneaded with clay, and found in the lacustrine village remains in Switzerland, are believed to have been for the same purpose. The arrow with a lighted tow torch is commonly noticed among the ancients, and is found in all parts of the world where the bow and arrow survive.

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[43] Aborigines of Australia, i, Fig. 170, p. 352.

[44] Wood, ii, p. 283.

[45] Wood, i.

[46] Louvre collection.

[47] Wood, ii.

The subject here naturally diverges and takes two separate paths. The projectile is loose and is hurled by a stick or a sling; or it is attached to a string which flies with it. We shall consider these separately and in the order stated.

The sling is an unimpressive object when hung up among a thousand other things in a collection, and how many were overlooked by the writer at the Centennial it is not possible to say. The example, Fig. 31, was in the National Museum exhibit in the Government Building, having been obtained from the Navajoes of New Mexico. Slings are rarely used among this people at present, except by boys. They are, however, mentioned in the old account of the "Journey to the Seven Cities of Cibola." There is no doubt about the antiquity of the device. It is mentioned frequently in the Hebrew writings, and is shown on the Egyptian[48] and Assyrian monuments.[49] The Roman sling was named from its *funda* or purse which contained the projectile. Besides its ordinary use for hurling stones, leaden balls (*glandes*) were used; these were ellipsoidal plummets, often with inscriptions upon them, as "FIR," for *firmiter*, "throw steadily"; Grecian bullets also, marked with the figure of a thunderbolt, or the inscription δεξαι, "take this," have been found. Schliemann[50] recovered from the excavations at Hissarlik sling-bullets of loadstone, copper, alabaster, and diorite. The *fustibolus* was a four-foot pole, which had a sling attached in the center, enabling both hands to be used in throwing.

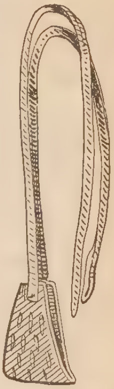
FIG. 31.—*Navajo sling.—National Museum.*

The sling is not so universal a weapon that a statement of the countries where it is used becomes a mere geographical recitation. The Javan sling[51] (*bandring*) is noticed by Sir Stamford Raffles. The Fijians, as already stated, excel in its use. The sling of the Sandwich Islanders[52] is a double thong with a stone receptacle of plaited sinnet. The stones are egg-shaped and ground for the purpose. Another form of Hawaiian sling has an oval stone with a circumferential groove, and is hurled by a cord passed around it and secured by a sailor's half-hitch so as to be released when the thong is jerked back to discharge the stone. A similar mode of hurling the spear is found in South America. The Marquesas Islanders[53] use slings of plaited grass, as much as five feet in length, and hurl stones of considerable size. The natives of New Caledonia[54] have a sling (*wendat*) which is a double thong with a purse in the middle made of two parallel cords. The stones are a hard kind of steatite ground to an oval shape and polished. They are carried in a net at the right side and are discharged after a half whirl of the sling. Some of

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[48] Kitto, i, 370.

[49] Layard's Nineveh, Pls. vi, vii, ii, 263. Xenophon's Anabasis, *lib.* iii, *c.* 3.

[50] Schliemann's "Troy and its Remains," 101. Nos. 66–7–8.

[51] "Java," 4to, Pl. iv, opp. p. 296, vol. i; Fig. 22.

[52] Wood, ii, p. 434. [53] *Ibid.*, ii, p. 390. [54] *Ibid.*, ii, p. 205.

the New Caledonian sling-stones are shaped like two spherical segments, joined at their bases, giving a sharp circumferential ridge. The same form is found in New Zealand and in the stone age missiles of Sweden.

Wooden slings and ribbon slings were used by the ancient inhabitants of Sweden, and slings of bast are in the museums of Lund and Stockholm.[55] Slings of plaited flax are among the lacustrine remains of Neufchâtel.[56]

The Solomon Islanders also use slings. The Fuegians[57] excel in the use of the sling, as well as of the bow and arrow and spear. The sling has a pocket of seal or guanaco skin and two thongs three feet in length of twisted sinews. The natives throw with great force and accuracy.

Pliny ascribes the invention of the sling to the Phœnicians. He always had a guess to make; sometimes a very wild one. The Balearic Islanders[57a] were celebrated for their expertness in its use. The slingers of the Greek and Roman armies were considered an inferior class of warriors, the sling being but an auxiliary weapon.

Another mode of slinging is by means of a stick thrust through a perforated stone and whirled so as to discharge the missile when it has attained a maximum centrifugal motion.

Fig. 32 shows two throwing-stones from Peru, adapted to be slung by a stick which is thrust into the hole. The Peruvians were very expert in the use of the sling.[58] Whorls of star shape were found in great quantities by Schliemann in the excavations at Hissarlik.[59] Although they may be considered spindle whorls, it is altogether probable, so great was their number, that they were ammunition. Disk-shaped and cylindrical throwing-stones perforated for the stick are found among the remains of the Lake Dwellers.[60] The Fijians have a rough game of jerking stones at each other with elastic bamboo.[61]

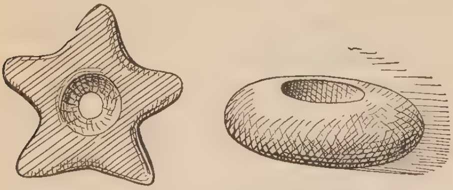

FIG. 32.—*Throwing-stones, Peru.*

Numerous stones fashioned into shapes, and many of them with circumferential grooves, are to be found in European and American collections, labelled *plummets* (net-sinkers), *sling-stones*, &c., according to the fancy or opinion of the discoverer or owner. The same may be said of American perforated stones which may be plummets or gorgets. There is a tendency to give a warlike signification to such finds recovered in the soil, in mounds or in graves. The civil uses of these objects were probably much more frequent than the warlike; as the search for food is a more constant occupation than war. (Cf. Sven Nilson, edited by Sir John Lubbock, London, 1868.)[62]

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[55] Sven Nilson "On the Stone Age." Ed. by Sir John Lubbock, pl. v, pp. 49, 53.

[56] Morlot in Smithsonian Report, 1863, p. 377.

[57] Wood, ii, p. 517.

[57a] Cæsar's Comm., ii, 1.

[58] Prescott's "Conquest of Peru," i, 72.

[59] "Troy and its Remains," No. 444, Pl. xl.

[60] "Culturgeschichte," Taf. 2, Figs. 60–63.

[61] Wood, ii.

We now pursue the other branch of the section, in which the ball remains attached to the cord by means of which it is projected. The simplest form of this is the single stone or metallic ball sewed up in rawhide and attached to the end of a thong a yard long. This, the *bolas perdida* of the Spaniards, is whirled rapidly around the head and then launched at the enemy or the game. A similar ball at the end of a shorter thong is used as a slung-shot.

The *bolas*[63] of South America consists of two or three balls at the ends of as many raw-hide thongs, about nine feet long, which are tied together. The *bolas* is swung around the head of the rider, the junction of the thongs being in his hand and the balls flying in a cluster. As soon as they are launched at the game, the balls fly apart by their centrifugal force, and, still flying round, have a movement of translation in the direction of their projection. As soon as a thong strikes the object, the balls coil around it in contrary directions, binding and entangling it according to the intention of the thrower. This is not too much to say, for the Patagonian will bind the rider to the horse, or tie the legs of an animal together or to the body at will. Stones of ovoid form made of trachytic tufa and perforated for raw-hide straps are used by the California Indians.

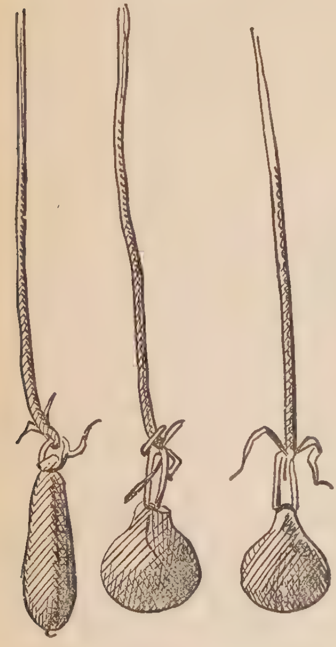

FIG. 33.—*Bolas of Paraguay, Argentine Confederation.*

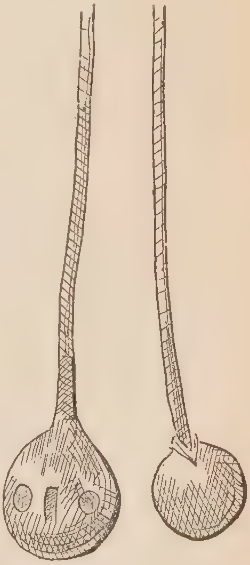

FIG. 34.—*Bolas of Argentine Republic.*

Figs. 33 and 34 show the *bolas* exhibited at the Centennial by the Argentine Republic. They consist of stones or balls of clay in raw-hide pockets at the ends of twisted thongs of raw-hide. The specimens differ much in weight, from one-quarter of a pound to one and a half pounds, and in size from one and a quarter inches to three inches in diameter. They are sewed up in their envelopes, and in one case openings are made to expose the bright red color of a peculiar stone of the country. It is the duty of the women to cut and grind these stones, but in some cases iron or even copper balls are used, the metal being preferred when attainable on account of its being smaller for a given weight. There is some variation in the arrangement also: (*somai*) two *bolas* at the end of 9-feet thongs; (*achico*) three *bolas*, one on a rather longer thong; or one of the thongs has attached to its mid-length a pair of balls on the end of three-foot thongs. The range of the *bolas* is from 30 to 40 yards. The natives, when in danger, wear several cuirasses of stiff raw-hide as a guard against them, the armor being put on like a poncho—over the head, which is thrust through a slit in the hide. The helmet is of double bull-hide. The *bolas* is used throughout the Argentine Republic, by the Gran Chaco Indians of La Plata, the Araucanians (called by them *laqui*), and the Patagonians; being, in a large portion of the territory mentioned, the principal means of capturing wild animals. The guanaco, a species of llama about the size of a deer, is the main dependence for food and clothing of the Patagonians.[64] See Muster's account of the Tehuelche Indians.[65]

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[62] Sven Nilson, Pl. ix, Fig. 216; Pl. ii, Fig. 31–35.

[63] Page's "La Plata," 112.

Passing at one bound to the other extremity of the American Continent, we find the Eskimo[66] in possession of the same weapon, but on a smaller scale, as befits the game it is intended to capture. It consists of eight or nine strings, about thirty inches long, and fastened together, their free ends being attached to little weights like plumb-bobs, made of bone, walrus-tooth, or stone. The cords are of twisted sinews or intestines. The balls are whirled around the head two or three times and then sent flying through the air like a large cobweb, lapping with surprising quickness around any object which may be struck by the cords. It is used principally in catching birds.

The lasso was shown in the exhibit of the Argentine Confederation, in the main building. It is a rope 40 feet long, made of raw-hide strips plaited into a round rope, excepting a few feet at the noose end, which is plaited square and is fastened around an iron ring, through which the lasso passes to form the noose. The Araucanians use a lasso of silk-grass fiber from the leaves of an agave. It has no ring for the noose, but a loop of the agave fiber covered with leather. In using the lasso, the ring is taken in the left hand and a noose six feet in length is made; the right hand then grasping the cord and the ring, the rider takes another six feet in his hand and whirls the noose around his head until it becomes circular, when he hurls it at the object, throwing after it the remainder of the rope, which hangs in coils on his left arm. As it passes through the air the noose becomes smaller, so that the diameter of the noose is graduated to the size of the object it is intended to capture. It is not a little singular that this form of lasso, a noose running in a metallic ring, was a weapon in the armies of the former Singhalese monarch.[67]

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[64] Wood, ii., p. 532.

[65] "At Home with the Patagonians," p. 166.

[66] Wood, ii., p. 711.

[67] Tennent's "Ceylon," i, 499.

A strangling noose, a few feet long, with a bone or wooden pointed stick at one end and a worked eye at the other, is used by the Australian to garrote a sleeping enemy. Passing the noose over the head and thrusting the skewer through the loop, he throttles his victim, who is powerless to make a noise, and, throwing him over his shoulder, carries him from the camp.[68]

II.—AXES.

If the name of a tool is to be determined by its shape and mode of usage, the first axe was of wood. The Australian department showed several bludgeons, the enlarged flattened ends of which had sharp edges. Being of blue gum (*Eucalyptus globulus*), a hard heavy wood, they are efficient weapons in war or in hunting, though not suitable for felling timber. They are shown at *a b*, in Fig. 35; *c d* are from New Zealand, and *e* is from the Haidah Indians of Bella-Bella, British Columbia.

The transition from one material to another may be traced in many countries in yet-existing tools; the change is one of the most interesting problems of the archaist and ethnologist, and it is recognized in a Chinese tradition: "Fuhi made weapons; these were of wood; those of Shinnung were of stone; then Chi-yu made metallic ones."

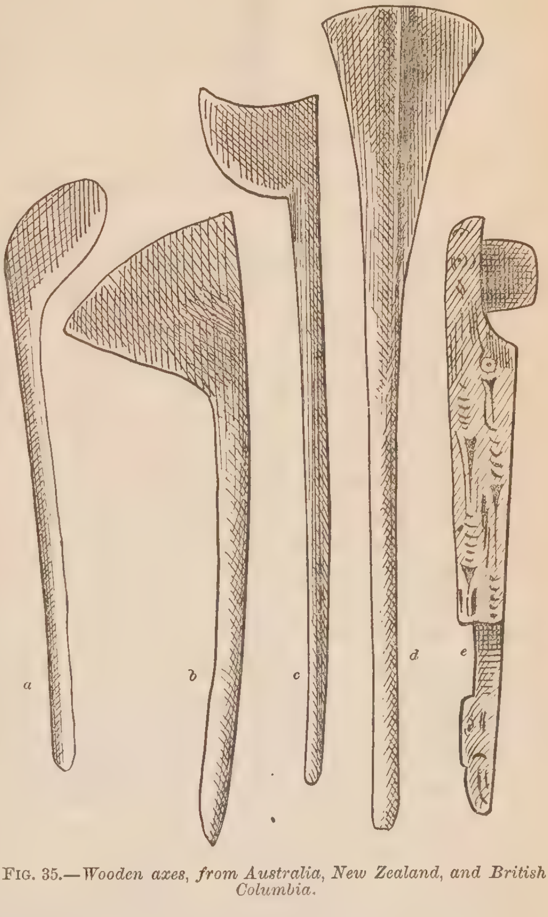

Fig. 35.—*Wooden axes, from Australia, New Zealand, and British Columbia.*

After the club or slung-stone, in which a bowlder is mounted on a withe, or bound to a stick, or slung at the end of a raw-hide thong, comes an attempt to give a cutting edge to the tool. It need not be merely assumed, as it is capable of demonstration, that the mounting of unwrought spalls of stone preceded the fashioning of stone axes. The

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[68] Smith's "Aborigines of Victoria," i, 351, Fig. 169.

New South Wales exhibit showed a collection of spalls of greenstone and sandstone obtained by the natives by merely dashing bowlders together and picking up the pieces which most nearly approximated the desired form. Those shown in the collection were of sandstone, conglomerate, slate, basalt, and trachyte. Such axes, when helved, are used by the natives in ascending and for felling trees, cutting firewood, in war and the chase, and for cutting themselves to embellish their bodies with cicatrized wounds.

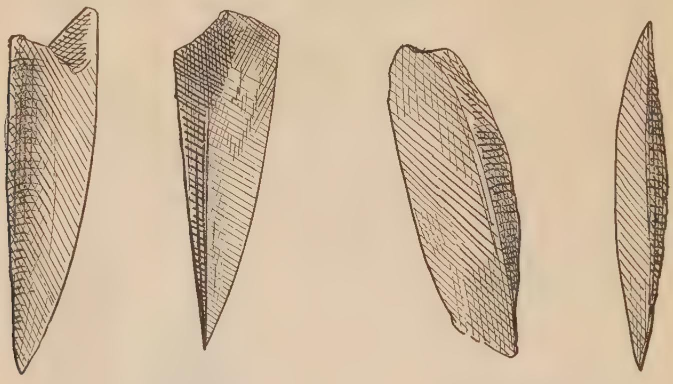

FIG. 36.—*Stone spalls for axes, Clarence River, New South Wales.*

In many countries are to be found famous localities yielding stones for axes. In Nan-hin-fu, in the province of Kwantong, in Southern China,[69] they find in the mountains a heavy stone, which furnishes materials for cutting-tools for the region around. Obsidian is used in Mexico, Khamschatka,[70] and elsewhere.

The stone axes and adzes of the Philadelphia Exhibition may be considered together. The difference in the tools is in the relation of the cutting edge to the handle. In the axe the line of the edge is in the plane of the handle. In the adze the edge is across the plane of its sweep. The examples afforded us may be classed in two divisions: first, stone and shell; second, metal. The subdivision which will be most useful will be as to the four methods of mounting the axe-head in or on the handle; and we have instances of each in the stone axes, and of three out of the four in the metallic axes, and this without going outside of the crude implements shown in Philadelphia.

The four modes of mounting or helving an axe are:

1. By winding a withe around it.
2. By lashing it to a seat on the handle.
3. By passing the tang through a hole in the handle.
4. By passing the helve through a hole in the head.

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[69] Grosier, "*De la Chine*," Paris, 1818, i, 191.

[70] Erman, "*Reise*," iii, 453.

Before adducing examples of each of these methods, we may simply notice the stone hatchet from New Zealand, which is used independently of a handle, and is a hand-to-hand weapon, like some of the *merais* or *pátu-pátus*, shown in a previous article, and considered characteristic of the Maori race.

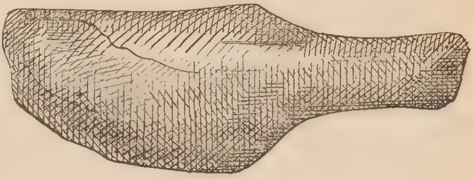
FIG. 37.—*Maori stone hatchet, New Zealand.*

While some of the methods of securing the axe-head to the helve are considered indicative of certain tribes and peoples, it cannot be said that any peculiar mode is found at a certain place or in such a tribe and nowhere else. In fact, it may be stated that among the various tribes of North American Indians all the modes cited may be found, and specimens from the lacustrine dwellings, to be seen in the museums of Europe and America, show that all the modes stated were in use among the early inhabitants of Europe.

Fig. 38 shows three native stone axes: *a* from Victoria, *b* from South Australia, and *c* from the Sioux country of the Missouri Valley. They agree in the mode of fastening the head to the handle, a withe being bent around a depression in the stone and secured by lashings; these will depend upon the material at hand. In the case of the stone axe (*mogo*) *a*, from Victoria, the head is a chipped greenstone 2 by 4 inches, and is mounted in a withe with moss and "black-boy gum." The weapon (*a*) is far in advance of the art of the present natives, who use the rudest stone axes, mere spalls, as just described, and shown in Fig. 36. The natives say that this *mogo* was made by a people who preceded them and of whom they have no knowledge. It need not on that account be necessarily very old, but it seems that it was somewhat of a local curiosity to the particular tribe in which it was found.

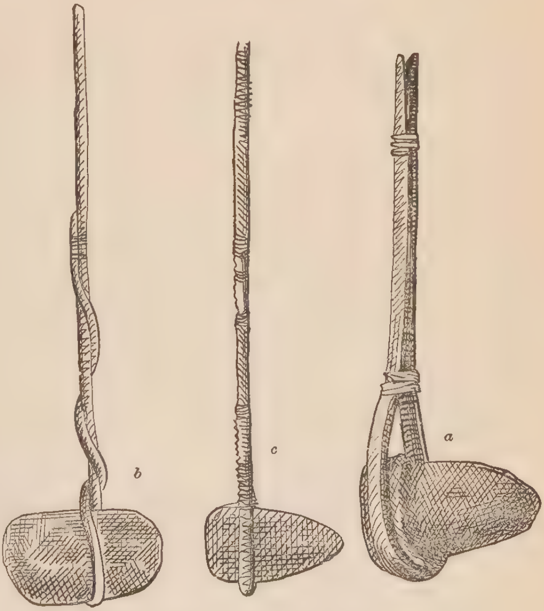

FIG. 38.—*Stone axes of Australia and America.*

The *kad-jo*, *mo-go*, and other stone tomahawks of Australia are well delineated and described in a careful treatise just published by R.

Brough Smith.[71] They are of granite, quartz, &c., one edge chipped sharp, a poll left relatively flat; all adapted to be handled with withes, unground, and secured by gum.

In New South Wales the natives take for the handle the flowering stem of the *waratah* or native tulip, or the vine of *pepperoma*, or they carefully split the small water gum of the streams, and, by the action of fire, make the piece pliant and wrap it like a withe around the stone axe-head. They next take the resinous and brittle gum of the grass-tree (*Xanthorhœa*), which they knead and toughen by the fire process. With the heated gum they cover the equator of the stone and take around it one or two turns of the pliant withe, securing its junction with a thong of the bark of the *coorajong* tree; they then fill that part of the handle secured around the stone with the melted gum, and the weapon is ready for duty in a few hours. By the aid of this instrument the natives chop notches for the toes in ascending high trees, cut out the opossum, or tap the trees for honey; with it they also fashion *waddies*, *boomerangs*, and other wooden implements, and crack the bones of animals for the marrow. In some portions of the island, sinews from the tail of the kangaroo do duty as lashings. The sinews are steeped in hot water, pounded between stones to separate them into filaments, and, while yet pliable, they are wrapped around the stone and the handle; in drying they shrink and hold the objects together with great firmness. The lashing is then covered with the "black-boy gum" of the grass-tree.

The *celt* or stone axe is one of the most common objects in museums, and generally shows its adaptation to a withe handle.[72] In the excavations at Hissarlik, at a depth of from 23 to 33 feet below the present surface, Dr. Schliemann recovered well-made axes of diorite and of hard and semi-transparent greenstone.[73] One of these was fractured at the eye, but they were generally adapted for withe handles. So common is the *celt* that it has entered into the superstitions of various nations, and is supposed to be a "thunder stone"[74] and to have fallen from the sky. This idea is prevalent in China, England, India, Brittany, Finland, Japan, Brazil, Madagascar, and elsewhere.

Axes of the second class, lashed to a seat on the handle, had numerous representations at the Exhibition. Fig. 39 is a stone designed to be mounted as an adze, and Fig. 40 shows a greenstone blade lashed to a handle formed of a limb with a portion of the adjacent trunk. The fastening is evidently but a substitute for the original elaborate lashing, which had fallen off. Some of the Maori adzes are of green jade. Another stone, locally known as *toke*, is also used, but is much inferior to the former in quality and appearance. Cf. black basalt adzes found in

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[71] "Aborigines of Victoria," Melbourne, 1878, i, pp. 359–380. Figs. 175–198.

[72] Dr. Abbott, in Smithsonian Report, 1875. Figs. 11, 19.

[73] Schliemann's "Troy and its Remains," p. 21, No. 2; p. 94, No. 56.

[74] Tylor's "Early History of Mankind," pp. 208, 210–211, 222–227.

Scania, Sweden,[75] and at Nootka Sound; also, the flint axes of Scandinavia, which are never bored, but are rough chipped and unground.[76] Axes of diorite, greenstone, and basalt have sometimes holes bored through, by which to suspend them.

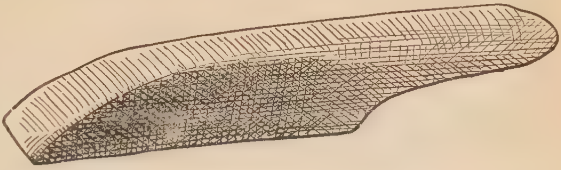

Fig. 39.—*Stone adze (unmounted), New Zealand.*

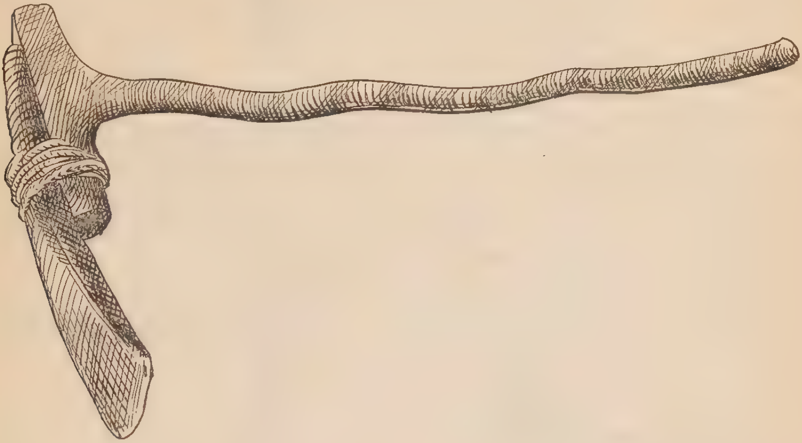

Fig. 40.—*Maori adze, New Zealand.*

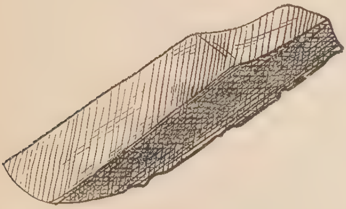

Fig. 41.—*Stone adze, Sandwich Islands.*

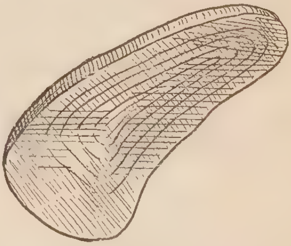

Fig. 42.—*Shell adze, Saint John's River, Florida.*

Fig. 41 is a stone adze (*koipele kainoa*) from the Sandwich Islands; it is nine inches long. Fig. 42 is a shell adze from a shell heap on Saint John's River, Florida. The adze of the Pelew Islanders[77] is made of the shell of the giant clam. Shell is used as a material for cutting instruments in many places where stone and metal are rare; such as were formerly some of the West Indies and some islands of Polynesia and Oceanica. The Pelew Island implement may be turned in the head so as to be used as an axe or an adze. The same adaptability may be found in an iron axe-adze of the Dyak of Borneo. The war axe of the Fijians is shown in Fig. 43. It was exhibited in the Main Building. Its stone head is carefully lashed with braided sinnet to an elaborately carved wooden handle.

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[75] Nilson's "Stone Age," Pl. vii, Figs. 147, 150, and page 62.

[76] *Ibid.*, p. 64, and Pl. vii, Fig. 153.

[77] Wood's "Natural History of Man," ii, p. 450.

The stone adzes of the Marquesas are most accurately shaped and finished, especially those of a ceremonial character. The handles of such are fairly honeycombed with carvings, in such a manner that a central handle appears to be surrounded by a sort of filigree or incrustation of geometrical work. The lashings of plaited coir (*sinnet*) are very elaborate and carefully laid. Specimens obtained by the Wilkes Expedition are in the National Museum of Washington, D. C.

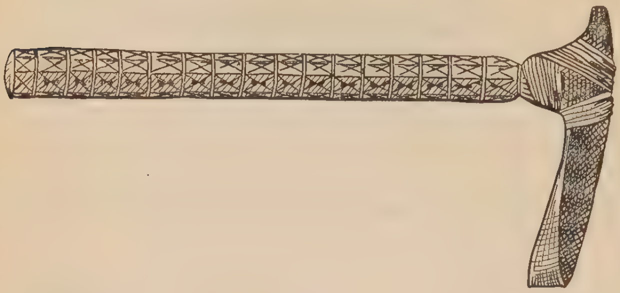

FIG. 43.—*Fiji war axe.*

The stone adze (Fig. 44) of the Makah Indians of Puget's Sound, California, shows an observation of the tools of the white man. The handle is evidently copied from that of a handsaw which the native mechanic had seen and admired. The use of the stone and the method of lashing are, however, quite characteristic. Fig. 45 is an ice-pick of walrus ivory, lashed to a handle of pine. It is from the Magemut Eskimo of Nunivak Island. Fig. 46 is an Eskimo ice-pick made from a whale's rib, lashed with raw-hide thongs to a massive yew-wood handle. These picks are used for breaking the crust of snow and in keeping the seal-holes open. The specimen is from Anderson River, British America. The example (Fig. 47) shows another variation in the mode of fastening. Like the former, it is made from a whale's rib, and is lashed with raw-hide thongs

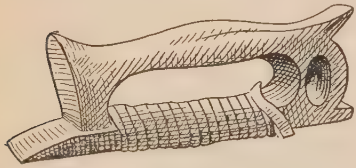

FIG. 44.—*Stone adze, Puget's Sound.*

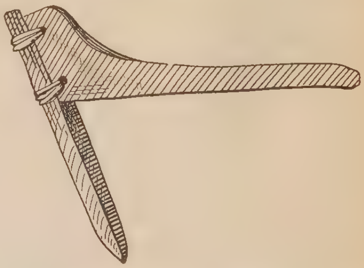

FIG. 45.—*Eskimo ice-pick, Nunivak Island.*

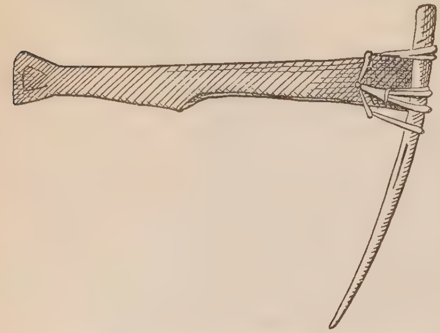

FIG. 46.—*Eskimo ice-pick, British Columbia.*

to a pine handle. It is from the *chook chees* (*Tschuck-tschis*) of Northeast Siberia. The mode of fastening is much like that of the old Egyptian hoes, as shown in Wilkinson's works.

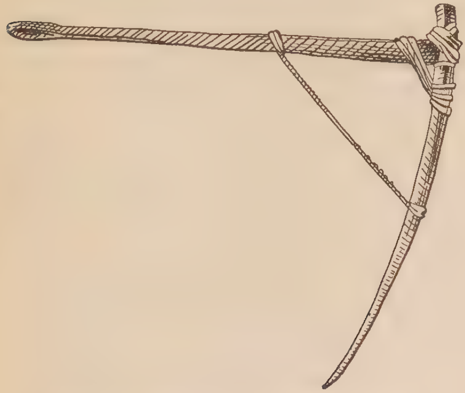

FIG. 47.—*Ice-pick and skin-dresser, Siberia.*

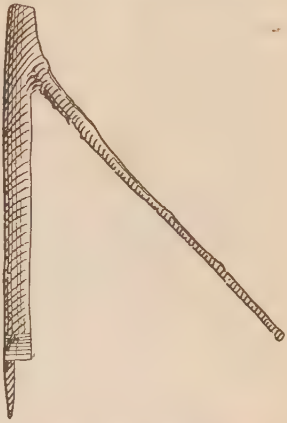

FIG. 48.—*Stone adze, British Columbia.*

Fig. 48 is the last illustration we shall offer of this mode of attaching the bit or blade to the handle of wood. It is a small adze of argillite lashed with twisted sinews to a handle formed of a forked branch. Such implements were used in smoothing the insides of canoes. The main stem was grasped by the left hand, and the smaller one by the right. It is from the Haidah Indians of Bella-Bella, British Columbia.

We reach the third class of our first division and notice the single instance in the Philadelphia Exhibition in which a modern stone axe was inserted through a hole in the handle. This has been deemed the characteristic African method, and with much reason, though instances of its adoption are found elsewhere; the New Caledonians, for instance, mount their axes like the Africans, putting the tang of the bit through a perforated knob on the end of the handle. As almost all the African tribes use iron, smelted and worked by native smiths, the instances of the African method will occur more frequently in the second division of the subject, which treats of metal.

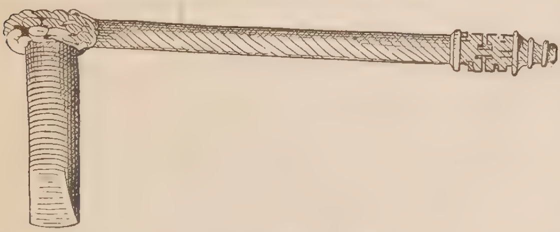

FIG. 49.—*Stone axe of Mozambique.*

The modern axe of greenstone (Fig. 49) is used in Mozambique, a Portuguese colony in Eastern Africa. The bit is 8 inches long, and is lashed with strips of raw-hide to a wooden handle, which is carved at the hand-hold. The lashing is covered with cowrie-shells, which form in part the currency of the natives; they answer, we may suppose, the same purpose as the gold mounting of a dress-sword. The inhabitants, though well acquainted with metal, retain old habits, and among them the use of stone implements, in ceremonial uses perhaps, rather than in the business of life. That stone should linger after the advent of metal is not surprising when we reflect that the stone battle-axe was used by many of the Anglo-Saxons at Hastings, and some of the Germans were armed with it at so late a period as the "Thirty Years' War."

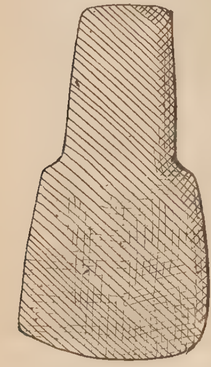
Fig. 50.—*Stone axe.*

Fig. 50 shows one of the articles generally catalogued as a "spade-like implement." It was possibly an axe adapted to pass through the handle and be secured by a lashing of sinew or raw-hide.

Fig. 51 shows five ancient implements obtained in various parts of the United States, from mounds and elsewhere; *a*, *b*, and *d* are from Louisiana; *e* is from Iowa; *c* not noted. The three last examples are double-headed ceremonial axes, and do not materially differ from examples in the figure following, excepting in not being perforated for the handle. The frequency of the omission indicates that the two methods of mounting were simultaneously employed.

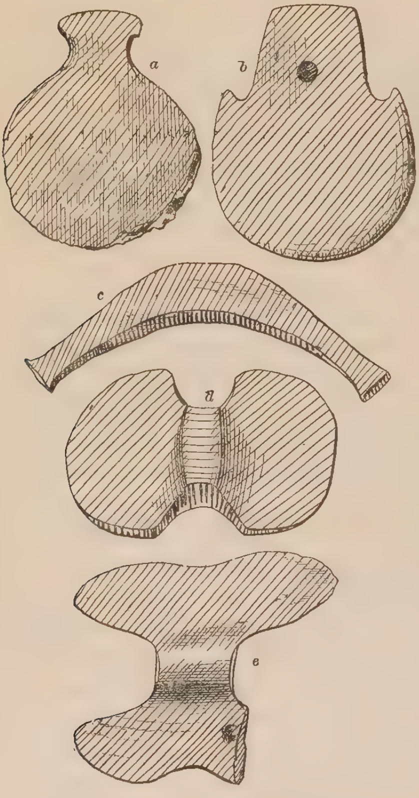

Fig. 51.—*Axes from Indian mounds, &c.*

This brings us to the fourth class—perforated axes, which are considered by Sir John Lubbock as probably characteristic of the early metallic period in Europe.[78]

It was long thought that the perforation of the axe-head did not occur until the implement came to be made of metal. It is true that the labor of boring in stone without the aid of metal and the weakening of so frangible a material might exclude that mode of mounting; but it must be recollected that time is of no moment to a savage, never having read Solomon or Dr. Watts, and not taking lessons from insects—which are simply a nuisance and point no moral in Africa.

The examples of perforated stone axes at Philadelphia (Fig. 52) were from various parts of the United States, and were shown in the National Museum in the Government Building. They are ancient and are generally supposed to be of a ceremonial character. It was either not noted or was not observed where *a* was from; *b*, *d*, and *g* were from Wisconsin; *c* from New Jersey; *e* from Connecticut; *h* from Pennsylvania. So the practice of making the perforated *bipennis* in stone was widely spread. It may be mentioned that the hole in *h*, Fig. 52, is only rudimentary. A fine selection of perforated axe-heads from Denmark is in the Peabody Museum, Cambridge, and a great many more at St. Germain, France, and in the museum of Geneva, Switzerland. This object is called a "banner stone" in Abbott's article on the Stone Age in New Jersey[79]; compare also Nilson's "Stone Age."[80]

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[78] Lubbock's Introduction to Nilson's "Stone Age," xxix.

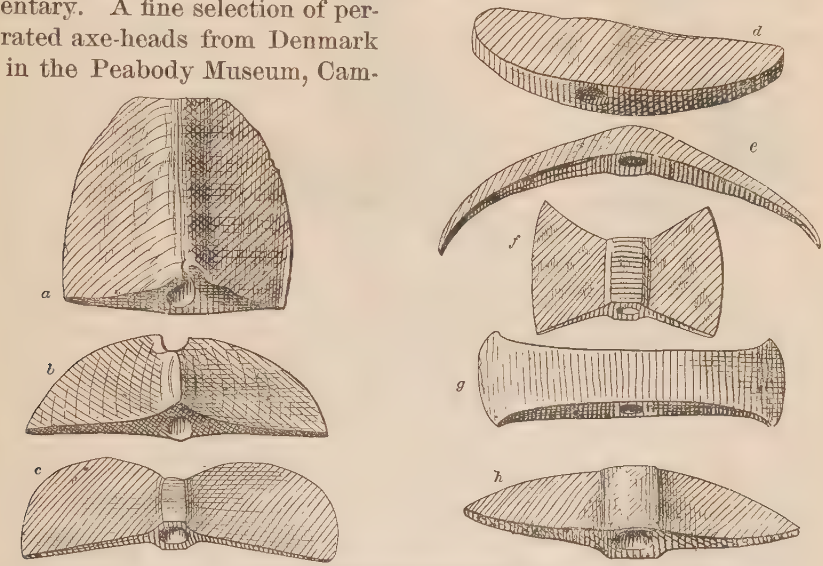

FIG. 52.—*Double-bitted perforated axes.*

The *bipennis*, or double-bitted axe, was the weapon of the female warriors of Scythian race known as Amazons. It was also known in Assyria. Its antiquity may also be assumed from its being the sacrificial axe of the Roman priesthood: *Dolabra pontificalis.* The old *scena* or *sacena* of the Latins had two cutting edges, large and small, the former *securis;* the latter *dolabra.* It may have been copied from the agricultural axe *dolabra*, which was something like our mattock, with an axe edge and a pick on the respective ends of the head, and was used in cutting wood and clearing land of bushes and grubs. The *dolabella* was the small axe or bill-hook. The sacrificial *malleus* was a round ball perforated for a handle, and it also seems to indicate the long-sustained use of very primitive forms of weapons and implements for ceremonial purposes.

Many copper battle-axes were recovered by Schliemann from a depth of 28 feet in the ruins of Hissarlik.[81]

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[79] Smithsonian Report, 1875, p. 332.

[80] Nilson, Pl. viii, Fig. 173 and p. 71.

[81] "Troy and its Remains."

We have now reached the second division of axes, those of metal. In this section we can scarcely preserve the quadripartite subdivisions of the stone group. The collection, however, furnished good specimens of crude workmanship in two classes of axes—those which are lashed to a seat on a handle and those which perforate the handle.

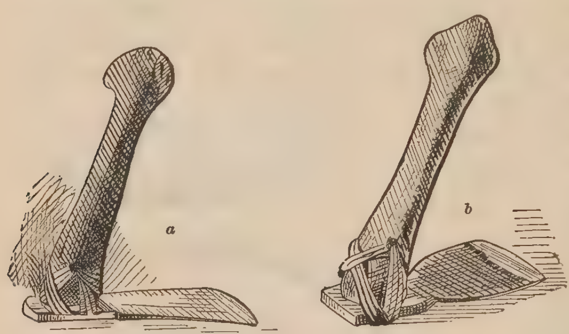

FIG. 53.—*Eskimo adzes.*

The examples of those which are lashed to a seat on the handle are, singularly enough, tools in which iron blades obtained from the whites have been attached to handles in the manner previously adopted with stone tools. Fig. 53 shows two adzes of the Anderson River Eskimo, the handles of which have been ingeniously fashioned to fit the hand. The blades are both made of hatchet heads, in one case (*a*) the eye is made use of in lashing the handle to the iron; in the other case (*b*) the eye has been ground away, and it is secured to the handle by thongs in the manner of a stone celt. The tools indicate both the inveterate habit of mounting and also the preference for the adze method of using.

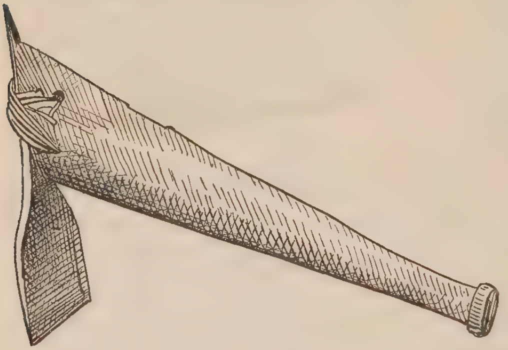

FIG. 54.—*Greenlanders' adze.*

The Greenlander's adze (Fig. 54), shown in the Danish department of the Main Building, is made of a common 2½-inch chisel strapped by a seal-skin thong to a beech wood handle about a foot long. Fig. 55 is a small hand adze or chisel with a bone handle. The blade was originally a hatchet of which the eye has been split and a piece removed. The handle shows an imitation of a saw-handle. It is from the Haidah Indians of Bella-Bella, British Columbia.

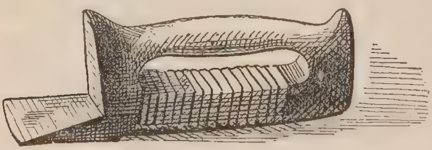

FIG. 55.—*Indian adze, Haidahs, British Columbia.*

The Javan axes[82] are mounted in different ways; two kinds, known respectively as *petel* and *wadung*, are chisel-shaped tools lashed to stocks whose natural growth as a fork facilitates that method; another, called

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[82] Raffles "Java," 4to, i, 174, Figs. 1, 2, 4.

sang'luk, has an eye for the helve in the manner next in order to be considered.

The Javan battle-axe (*kudi tranchang*), formerly a principal weapon of Java,[83] is not now much used, and is suprisingly like a freakish weapon used by the natives of Central Africa.

The Japanese axe is a compromise, its bent tang being held by a ring which slips on the handle.[84]

Africa furnishes us with the greatest variety of the axes which perforate the handle. Beginning at the south, we find the Kafirs[85] in possession of an axe, but their principal weapon is the *assegai*, a javelin made by their native blacksmiths. With the *keerie* or short club, shield, and assegais, a Zulu considers himself well furnished.

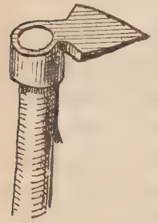

FIG. 56.—*Japanese axe.*

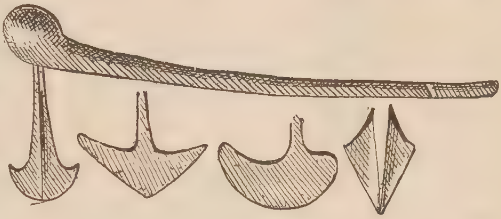

FIG. 57.—*Bechuana axes, South Africa.*

The Bechuana axe, Fig. 57, is a steel bit simply fastened by a tang in the enlarged wooden head. The term Bechuana may be used generally to include a number of tribes, embracing the Makololo,[86] who are among the most accomplished workers in metal on the continent.

The smaller axes in Fig. 57 are other patterns, made by the Bechuanas; and Fig. 58 is a still more fanciful one, shown in the Portuguese Colonies Department of the Agricultural Building. The head is of steel and the handle is in part wrapped with fine wire. The blade is peculiar in form and ornamentation, and has what we should consider a rather insecure attachment to the helve. Fig. 59 is another axe of Angola, shown in the same collection; it has a curious curved blade and a long tang inserted in the usual African method into the wooden handle.

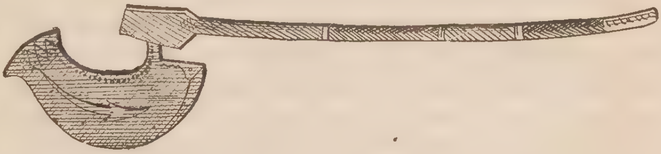

FIG. 58.—*Battle-axe, Angola, Africa.*

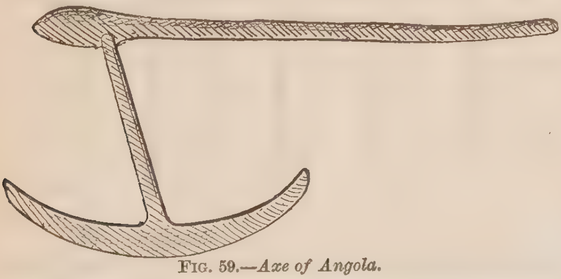

FIG. 59.—*Axe of Angola.*

The elephant axe of the Banyai,[87] of the Zambesi, was also snown in the group of Angola and Mozambique weapons, Fig. 60. It has a very long tang projecting entirely through the handle, and secured thereto by raw-hide lashing. One end has an axe-blade and the other a spear point. The handle is made by cutting off a limb of a convenient length, and also a small piece of the trunk at the insertion of the branch. A hole for the tang is then bored through the knotty wood, where the limb is as it were rooted into the body of the tree. The handle is then dressed to shape. The blade is sometimes three feet in length, and is carried over the shoulder. It is used in ham-stringing the elephant. The hunters go in pairs, one carrying the axe while the other goes before the animal to distract his attention. The axeman comes up behind stealthily and severs one ham-string of the animal at a single blow. One form of the elephant axe was noticed to have a curved handle and a stay-lashing at a point six inches distant from the socket.

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[83] Raffles "Java," 4to, i, Pl. opp. p. 296, Fig. 7.

[84] Siebold's "Nippon," vi, Pl. 6; also ii, Pl. 5 *bis.*, Figs. 14, 9, 15, 16, 13; also ii, Pl. 11, 13.

[85] Casalis' "Basutos," 132.

[86] Baines' "South Africa," 467.

[87] Wood i, p. 404.

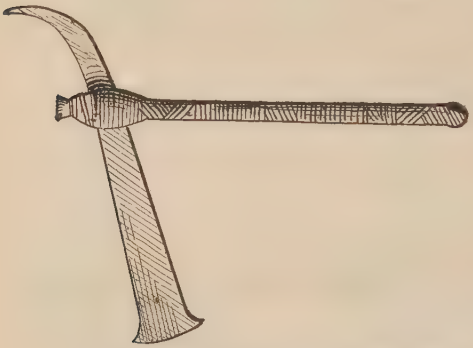

Fig. 60.—*Elephant axe of the Banyai, Zambesi, Africa.*

The Banyai of the Zambesi have also a convertible axe and adze. The knob of the handle has two slits at right angles, so that the tang of the blade may be optionally inserted either to bring the edge in line with the sweep of the tool, as with the axe, or transversely, as with the adze. Curiously enough the Water Dyaks, of Borneo, have a chipping tool of the same kind used in boat-building.[88] It has an iron blade, wooden head, and ratan (Malay *rôtan*) lashing. The blade has a square tang, and by taking it out of the socket, turning it one-quarter round, and inserting it again the blade is changed, in reference to the handle, from an axe to an adze, or *vice versa*.

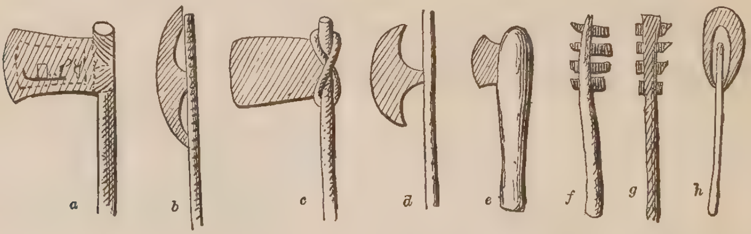

Fig. 61.—*Axes of Egypt, India, Mexico, and Yucatan.*

The Djibba axe has two pointed prongs projecting lengthwise from the head to make it efficient in thrusting. The Monbuttoo axe,[89] following the universal African type, has its tang inserted through the thick end of a knobbed club.

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[88] Wood, vol. ii, p. 453.

[89] Schweinfurth's "Africa," vol. ii, p. 112.

Fig. 61 shows that this system of inserting the blade in the handle has been practiced in far distant times and places. *a b* are ancient forms of Egyptian bronze axes.[90] *c d* are ancient axes from the Sachi tope[91] at Bhilsa, in Central India. *e* is an axe shown on a Mexican monument. The obsidian or copper blade is inserted in the handle. *f* and *g* show the instrument known as *mahquahuitl*, a double-headed axe with obsidian flakes inserted in wooden handles. *h* shows a copper axe of Yucatan, the plate being inserted in a slitted handle. The battle-axe was the weapon of the Peruvian soldiery.[92] Numerous Trojan battle-axes of copper were found by Dr. Schliemann at Hissarlik.[93]

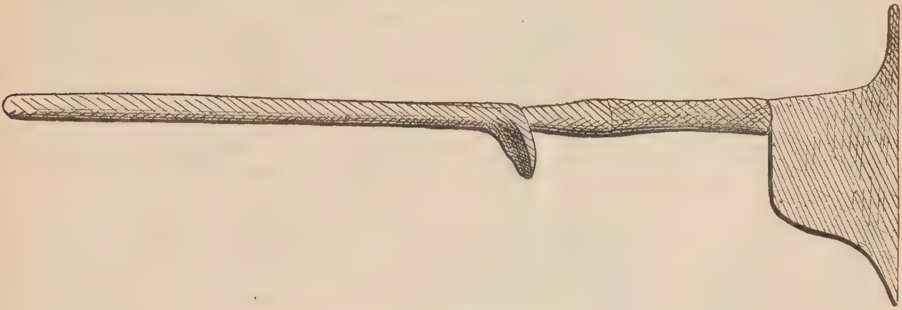

Fig. 62.—*Axe of the Philippines.*

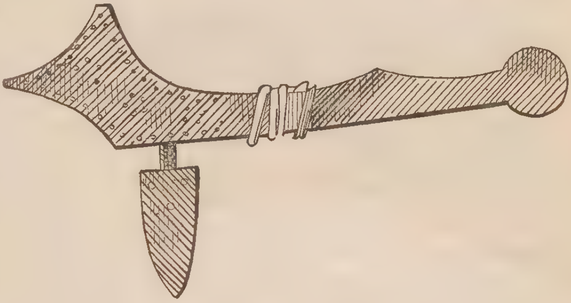

Fig. 63.—*Casse-tête, Dakotah.*

The axe of the Philippines was shown in the Spanish Building. It has a peculiarly shaped head and a long ferrule. The hand-stop on the helve was the only instance of the kind in the exhibition. It is a sort of rudimentary guard, like a partial hilt on the two-handed helve. (Fig. 62.)

The jungle hook of the Singhalese (*wal-dakat*) and a chopping axe (*proa*)[94] are used for clearing brush and cutting trees. Even the poor Veddahs of the interior forests "have a little ax, which they stick in by their sides, to cut honey out of hollow trees."[95]

Fig. 63 is a Dakotah Indian war-club (*casse-tête*) ornamented with carving and armed with a leaf-shaped steel point. The peasant of Brittany carries a knobbed stick resembling the *Kafir knob-keerie.* (Fig. 1.)

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[90] Kitto, vol. i, p. 507; "Duleth," p. 7.

[91] Cunningham's "Bhilsa Tope," pl. xv, Figs. 8, 9.

[92] Prescott's "Conquest of Peru," vol. i, p. 72.

[93] Schliemann's "Troy and its Remains," pp. 330, 331.

[94] Knox's "Ceylon," pp. 273–4.

[95] *Ibid.*, p. 61.

It is called a *casse-tête* by the French of the neighboring departments, but *pen-bas* by the Bretons.[96] See also the marble knob for a stick, found by Dr. Schliemann at Ilium.[97]

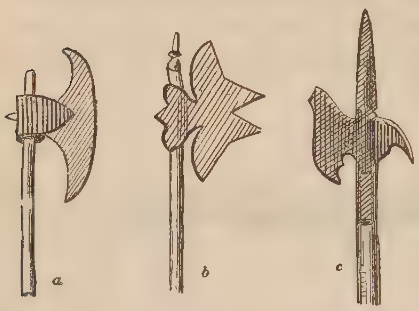

FIG. 64.—*Halberds, India and Norway.*

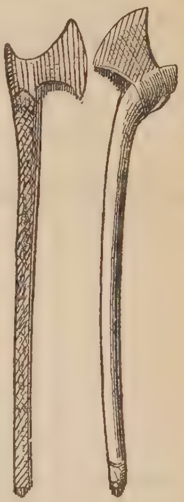

FIG. 65.—*Norwegian axes.*

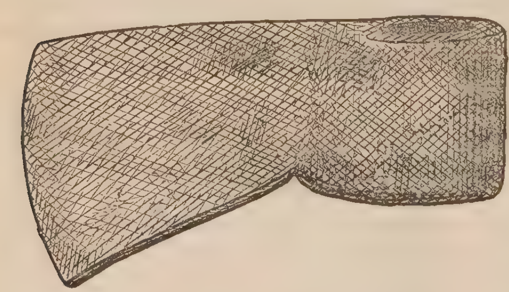

FIG. 66.—*Iron tomahawk, Dakotah.*

The same form is shown by Catlin to have been very common among the Blackfeet and other Indian tribes on the headwaters of the Missouri. An axe of Terra del Fuego, shown by Nilson, has a blade of iron inserted in the African manner in a wooden stock which has been dressed by flint tools.[98] Desor also shows hatchets of diorite, serpentine, and quartzite in sockets of buckhorn, which were mounted in a wooden handle by a lateral hole in the side of the club. In another case the stone was inserted endwise in a horn socket which was pierced for the handle.[99] In another case the stone in a horn handle had the position formerly occupied by the brow antler.

Fig. 64 shows three forms of halberds, light axes on long handles: *c* is from Norway and belongs to the class with a tang driven into the handle; *a b* are Sowrah battle-axes from India, and belong to the last class of our list—the handle inserted through an eye in the head. To this also belong the Norwegian axes (Fig. 65) and the Arickaree iron tomahawk (Fig. 66).

III.—KNIVES AND SWORDS.

The knife in its primitive form is a sharp flake of stone or obsidian, a sliver of bamboo or wood, or a shell with a sharpened edge. When the point is the specially engaged portion the weapon is a dagger. Many other crude materials furnish the hand-to-hand cutting or piercing weapons, such as the pointed horns of animals, the tail of the sting-ray, shark's teeth tied upon a staff, and sharpened bones. When the disposition exists a weapon will be found somewhere, and the most curious are those where the choice of material is but small and metal is inaccessible. Metal once obtained, the variety of weapons decreases, and knives, daggers, and swords assume a somewhat uniform character.

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[96] Trollope's "Summer Tour in Brittany," London, 1840, Pls. opp. pp. 125, 220, 296.

[97] Schliemann's "Troy and its Remains," p. 265.

[98] "Stone Age," Pl. vii, Fig. 155.

[99] Desor. transl. in Smithsonian Report, 1865, pp. 360, 361, Figs. 17, 18, 19.

The persistent ceremonial use of stones for knives, after the use of metal had been fully established for the ordinary affairs of life, is noticeable in many old records and in the observation of late travelers. We may mention the stone knives used by the Egyptians, Ethiopians, and Hebrews in circumcision,[100] by the Egyptians in embalming,[101] in obtaining the balm of Gilead,[102] in the human sacrifices of Mexico, in the gashing of the flesh of fanatics,[103] and in inducing the cicatrized wounds which form the ornaments or tribal marks of some savages. To these may be added the gashing of the flesh by the New Zealanders in their mourning, and the stone fleams used by the North American Indians for bleeding.

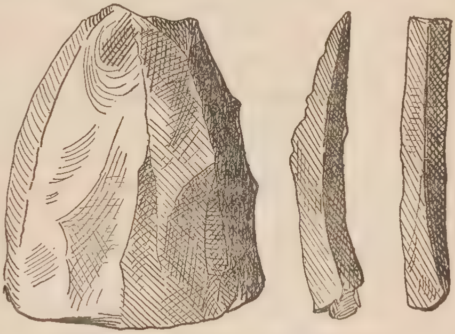

FIG. 67.—*Obsidian nucleus and flakes, Mexico.*

Museums have crude stone spalls and well-fashioned knives of stone in variety, but we can only appeal for illustrations to the collection in Philadelphia. In the upper and stone periods of the hill of Hissarlik in Asia Minor, Schliemann found numerous flint knives.[104] Some have edges like ordinary knives; others are serrated. At a depth of 23 feet he found double-edged knives of obsidian, sharp as razors.

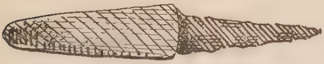

FIG. 68—*Obsidian knife, California.*

Flint flakes and nuclei from the stone age of Scandinavia, and flint knives from Greenland and New Zealand made of spalls, and others of chipped flint, are shown by Nilson[105] and by Dr. Abbott, of New Jersey.[106]

Obsidian was a favorite material where obtainable. It was used in Mexico in the manufacture of sacrificial flake-knives, arrow-points, &c.[107] The flakes were split off by the skillfully applied pressure of a T-shaped wooden implement. The nucleus and flakes (Fig. 67) were shown in the National Museum and are from Mexico. The same collection in the Government Building had the obsidian knife (Fig. 68). This has a wooden handle which shows the marks of a similar cutting instrument, and is therefore a veritable specimen of the stone age.

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[100] Exodus, iv, 25; Joshua, v, 2.

[101] Herodotus, ii, 86; Diodorus Siculus, i, 91; Kitto, i, 81.

[102] Pliny, xii, 54.

[103] *Ibid.*, xxxv, 46; xi, 109. Compare also Pliny, xix, 57; xxiii, 81; xxiv, 6, 62.

[104] "Troy and its Remains," p. 79.

[105] "Stone Age," p. 76 and Pl. ii; Figs. 24, 23, and Pl. iii, v.

[106] Smithsonian Report, 1875, p. 300.

[107] Torquemada.

The Yellowstone Park has lately been stated to possess hills of obsidian of different colors, which have afforded for ages the material for the arrow-heads of the Indian tribes in the vicinity.

The flint knives of the Indians of the California peninsula are mentioned by Baegert.[108]

As far away as the Admiralty Islands of the Papuan group we find obsidian used for knives, razors, and spear-points.[109] The natives tie the spear-heads to the shaft with plaited string coated with gum. The knife used by the New Caledonians for carving the human body is called *nbouet*, and is a flat serpentine stone oval in form and seven inches in length. Holes are bored in it, by which it is fastened to a wooden handle. The New Caledonians eat their slain enemies, the women, who are the cooks, following the army and dragging the bodies off the field to prepare them for the supper of their returning husbands and brothers. The palms being considered as tid-bits, are the perquisites of the priests. Each part belongs to certain persons, and the carving is regulated by rules. The body is opened by the *nbouet* and the intestines removed with a fork made of two human arm bones sharply pointed and lashed together. The women cooks prefer to truss the bodies in sitting posture, bake them whole, and serve them in war costume.

Many collections show knives of flakes of silex mounted in wooden and horn backs,[110] and serrated knives or saws made by the insertion of flakes of obsidian, flint, or shark's teeth in a grooved wooden back. Some are mentioned later when referring to spears. Such are found in California, Sweden, the Philippines, Australia, and elsewhere. The knife[111] *dabba* of the Victorian blacks consists of quartz fragments attached to a wooden handle with gum.

Passing to knives of wood, we find none which would make impressive illustrations; in the South Sea islands wood has been the principal material; until lately stone was unknown in some islands, and metal in almost all. The Fijian knife for cutting up *bakolo* (long pig), as the edible human body is called, was a sharp sliver of bamboo.[112] The Ajitas of the Philippines and New Guineans also use the bamboo sliver.[113] The Sandwich Islanders have a battledore-shaped piece of wood[114] like the *merai* of the Maories, but armed on the edge with shark's teeth. It was formerly employed in cutting up the bodies of warriors who fell in battle, or of persons sacrificed. The Mundurucus of the Amazon use a bamboo knife in decapitating their enemies to prepare the heads as trophies. The gentle savages are, however, not oblivious of the value of metal when they have an opportunity to see it. Francis Sparrow, whom Raleigh left to explore the country of the Orinoco, received eight beautiful young women for a red-handled knife—value in England at that time equal to one cent.

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[108] Translation in Smithsonian Report, 1863, p. 363.

[109] Wood, vol. ii, p. 302.

[110] Desor. transl. in Smithsonian Report, 1865, p. 360.

[111] Smith's "Aborigines of Victoria."

[112] Smythe's "Ten Months in Fiji," p. 85.

[113] Wood, vol. ii, p. 242.

[114] *Ibid.*, vol. ii, p. 435.

The Australian dagger is a stick pointed at both ends, grasped by the midlength, and struck right and left.[115]

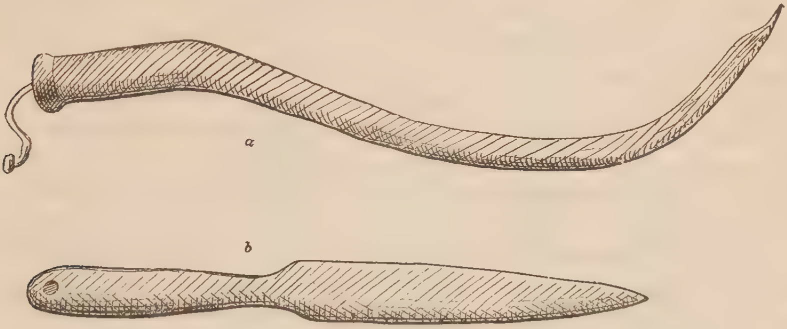

FIG. 69.—*Greenlanders' bone knives.*

In the extreme northern countries no material is so ready to hand as bone. The harpoons, knives, and many other domestic implements of the Eskimo are of bone. Fig. 69 shows the fish and blubber knives of the Kajak natives of Greenland. They were shown in the Danish collection in the Main Building. *a* is made of the bone of a whale, and is 18 inches long; *b* is of wood, and is 10 inches long. Fig. 70 shows two other bone implements of the Kajaks, a bone knife used in skinning the seal, and a fish scoop. The knife is 14 inches long and two and a half inches wide; the bone spoon is four inches long and two wide.

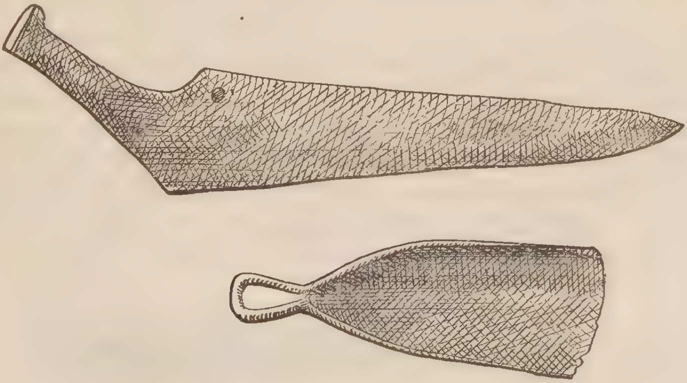

FIG. 70.—*Bone implements of Greenland.*

Some of the bone knives of the Laplanders are very elaborate, especially those used in preparing skins.

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[115] Smith's "Aborigines of Victoria," vol. i, p. 302.

The Eskimo in winter live in dome-shaped houses, called *igloos*, built of blocks of ice or snow. These blocks are *voussoir* shaped, so that they make a safe and symmetrical vaulted structure. They are hewn from the bank or field of solidified snow with large knives like Fig. 71, made of the bones of whales. Several of these knives were shown in the National Museum and in the Greenland department of the Danish collection. Two men, one to cut blocks and one to lay them, will erect a house in two hours. Just above the door a large plate of fresh-water ice is built in so as to illuminate the interior. Inside is a raised bench of snow, on which are laid sprigs and such scanty vegetation as the summer affords, to support the seal-skins which form the bed and bench. The dwellings are sometimes as much as 16 feet in diameter and 8 feet in height. The inevitable lamp is a stone dish with a wick of moss supported in it, and a quantity of oil fed from blubber piled upon it. This lamp is at once the warming and cooking stove, the light, the means of drying the clothes and melting the snow for drink, for the whole family occupying the *igloo*. Above the lamp is the cooking-pot, which also does duty in containing snow to be melted for drinking water. Above the cooking-pot (and by this time we are pretty near the roof) is a net spread to hold wet fur clothes, in order that they may be dried; after which they are chewed to make them supple.

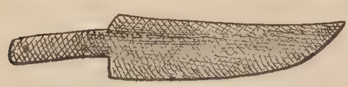

FIG. 71.—*Eskimo bone snow-knife.*

Poniards and pike-heads of bones of deer and urus are described by Desor.[116]

One or two other instances of animal material used in knives and daggers may be mentioned before we reach the metallic. The double dagger of the East Indies has two sharpened antelope horns joined at their bases; or it is a single straight two-ended blade of steel, a circular guard protecting the handle of the weapon, which is intended to strike right and left in a crowd. The Sandwich Islanders use daggers (*pahúa*) of wood, held in the middle and having a point at each end. The large mussel shell is the knife of the Fuegian; the original edge is knocked off and the solid portion made sharp by grinding upon a stone. The dagger of the Pelew Islanders is the tail bone of the sting-ray, and it is carried in a sheath formed of a joint of bamboo. The Tahitian dagger has the tail of the sting-ray as a point; it comes off in the wound and works deeper and deeper.

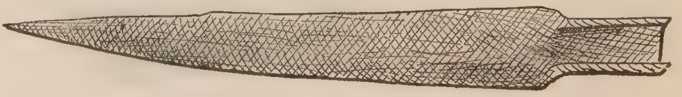

FIG. 72.—*Indian knife of native copper.*

This brings us to metal, of which we first consider copper.

The copper knife, Fig. 72, was taken from an Indian mound. It does not appear that any of the North American Indians who had access to copper worked it by smelting; but they treated it as malleable stone and shaped it by hammering. The Greenland Eskimo make knives from the copper obtained from Coppermine River, from flint, from walrus ivory, or from such pieces of iron as they may obtain by barter or may pick up from whalers or explorers.

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[116] Desor. Translation in Smithsonian Report, 1865, p. 358.

Fig. 73 shows a number of copper implements—knives, a spear, and a hook; these are Indian remains from Wisconsin, the metal having doubtless been obtained from the Lake Superior copper district in earlier times. They, together with many other copper tools, were exhibited by the Wisconsin Historical Society in the Mineral Annex of the Main Building. We cannot pretend to distinguish carefully between the weapon and the domestic implement. A knife is a knife whether for the throat of an enemy or of a deer.

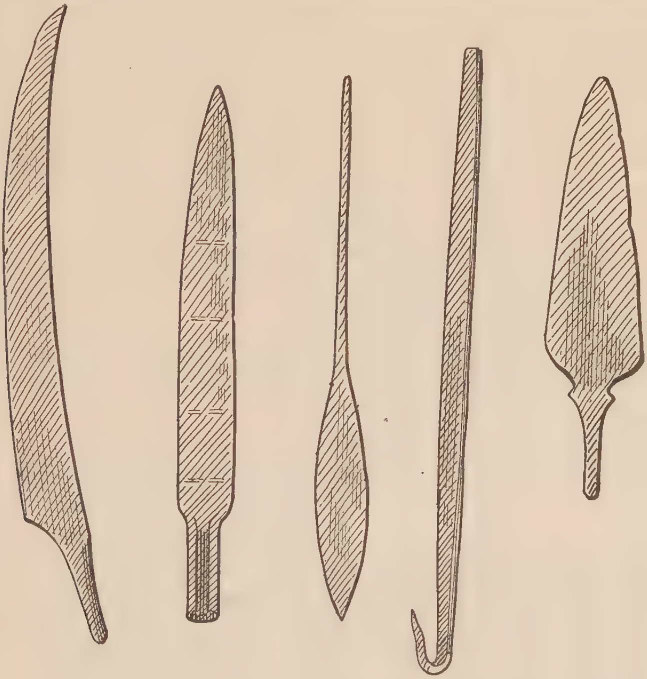

Fig. 73.—*Native copper implements, Wisconsin.*

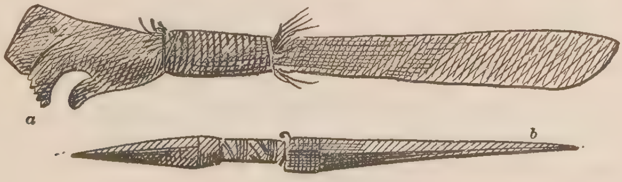

Fig. 74.—*Copper weapon and steel dagger, British Columbia.*

Fig. 74 shows a knife-like club *a* of native copper, a hereditary possession in the family of a Haidah chief in British Columbia. Beneath it is shown a double-ended dagger (*b*), bound with copper, and obtained from the Kutchin Indians of Northwest British America. Such daggers are forged by the Indians from old files obtained from sawmills near the settlements. They are in general use among the northern and northwestern tribes.

Copper seems to have been the earliest metal to be fashioned into tools, and its alloy, bronze, the first efficient tool material. Molds of mica schist for casting copper weapons and ornaments were found by Dr. Schliemann in the hill of Hissarlik.[117] There are also many such specimens in museums. The modern supposition that the ancients had a method of tempering copper as we do steel—or with analogous effects at least—is a myth. The metal acted upon was the alloy, bronze, and the range of effects is far inferior to the capacity of steel.

The Assyrians wore a profusion of daggers, two or more in the same sheath.[118] The handles were elaborate, made of ivory, inlaid, set with precious stones, carved the shape of heads of animals, etc. One of copper was found by Layard at Nimroud. The Assyrians, like the Persians, probably used them as knives.

Copper knives were found by Schliemann[119] in the lowest stratum of the excavations at Hissarlik; one of them was gilt. Also a number of copper daggers at a depth of 28 feet.

Egyptian knives were of bronze and of copper.[120]

A comparison of the forms of knives of the ancients and moderns shows that what may be termed the "leaf-shape" has been very general. It is true that the variety of shapes of leaves is so great that the term may be held indescriptive; it suits the case, however.

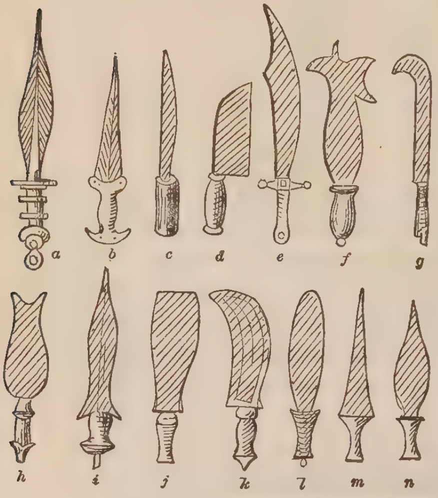

FIG. 75.—*Ancient Roman and modern African knives.*

Fig. 75 shows, in the upper row, a number of Roman knives of the classical period, and in the lower row a number of African knives of the present day. *a* is the *secespita*, a sacrificial knife with an iron blade and an ivory handle ornamented with gold and silver; *b* is the *pugio* or two-edged dagger worn by the officers of the army and by persons of rank; *c* is the *culter coquinarius*, or cook's knife; *d*, the *cultrarius*, for cutting the throat of the sacrificial victim; *e*, the *c. venatorius*, or huntsman's knife; *f*, the *falx vinitoria*, or vinedresser's knife; *g*, the *falx arboraria*, for pruning and hedge-trimming.

The swords of the bronze age, dug up from the lacustrine village sites, are many of them like some of the figures, in the upper especially. See Desor,[121] where they are shown, some with grooved blades and as much as 59 centimeters in length; also bronze poniards and knives with tongs and sockets.[122]

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[117] Schliemann's "Troy and its Remains," p. 139.

[118] "Nineveh," vol. ii, p. 264.

[119] "Troy and its Remains," 150; pp. 332, 333.

[120] Wilkinson. Kitto, vol. i, p. 372.

The lower row shows *h i j k*, knives of the Fans of Western Africa. These are sometimes as much as three feet in length and seven inches in width; they are kept very sharp in a sheath of wood, which is in two halves, and is bound together with strips of raw-hide covered with snake or human skin. *l* is an Unyoro knife of iron, the handle bound with copper wire.[123] *m n* are two two-edged daggers of the Niam-niams.[124] The dagger is worn in a sheath of skin attached to the girdle. The lances knives, and daggers have blood-grooves, differing in this respect from the Bonjo or Dyoor weapons. Both of the last-mentioned tribes have two-handled knives. The Bonjo knife[125] is used by the women in peeling tubers and slicing gourds and cucumbers; it has an oval shape, and is sharp on both sides, like the Unyoro knife *l*, Fig. 75. The Dyoor knife[126] is spindle-shaped, and is used for similar purposes.

Dr. Schliemann found, in his excavations at Troy, a dagger of steel four inches long. The blade, which is double-edged and in the form of an arrow, is 1.6 inches long, and in a perfect state of preservation, which Dr. Schliemann attributes to the antiseptic power of the red wood ashes, mixed with charcoal, in which he found it embedded, in the large mansion close to the gate, 28 feet below the surface.

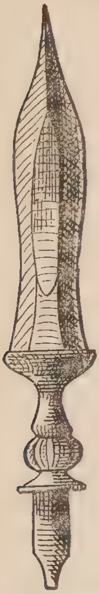

FIG. 76.—*Dagger of Balonda, Africa.*

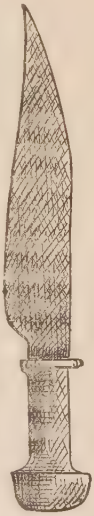

FIG. 77.—*Angola Dagger.*

The Balonda dagger from the Zambesi is shown in Fig. 76, and has a remarkable resemblance to *a* and *i*, Fig. 75, which are respectively Roman and Gaboon. This dagger is 24 inches long, and the handle is partly wrapped with raw-hide. The handle is by no means a convenient one, but no doubt the owner felt well satisfied with its ornamental appearance as it protruded from the scabbard.

Fig. 77 is an Angola dagger, with an iron blade and wooden handle. It looks much more like business than its fellow.

Fig. 78 shows an Angola dagger, with a strangely-shaped scabbard of sheet copper. It has a copper-covered wooden handle and a steel blade. The broad base of the sheath is probably indicative of its nationality, the same feature not having been noticed elsewhere. Its purpose is not apparent. The sheath of the *kris* has a considerable lateral enlargement at the upper end, but that weapon has a corresponding guard. It will be referred to presently, among swords.

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[121] Translation in Smithsonian Report, 1865, p. 374.

[122] *Ibid.*, pp. 374, 371–'72.

[123] Baker's "Ismailia," plate opposite p. 135.

[124] Schweinfurth's "Africa," vol. ii, pp. 10, 27.

[125] *Ibid.*, vol. i, p. 281.

[126] Wood, vol. i, p. 503.

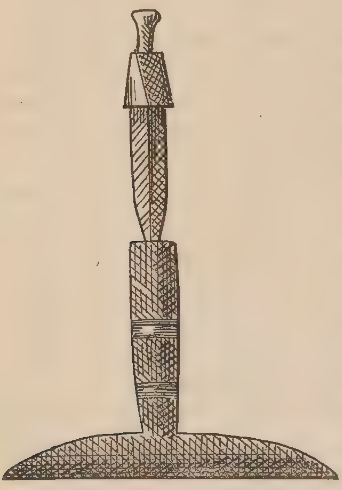

Fig. 78.—*Angola dagger.*

The collection of savage arms from the Portuguese colonies of Angola and Mozambique, exhibited in the Agricultural Building, was not excelled in its kind in the whole Exhibition. With many additions, it was again exhibited in Paris in 1878.

Some of the articles therein shown were from the Banyai of the Zambesi, the Bechuanas, and tribes with which the parties crossing between the western and eastern coasts of the continent come in contact. Passing south and west to Natal, a very warlike people, the Zulus and Basuto Kafirs, are encountered. The articles from this people were shown in the Cape of Good Hope collection, and are noticed among clubs and spears; they do not use the bow and arrow. The *assegai* is the principal knife of the Kafir.[127] It is of semi-steel of soft temper, and will bend and keep its shape, which is taken advantage of by the natives in making bowls, spoons, and pipes. He prefers it to the steel of the white man, which breaks. The Bechuanas make the best knives in that region, and barter them to other tribes. The blade has a long lanceolate shape, with two edges, and the weapon is worn suspended from the neck.[128] The handle, of ivory or wood, is carefully carved, frequently representing an animal, a hyena or giraffe, for instance. The wooden sheath is made of two pieces of wood, hollowed out and bound together with sinews. The same is used among some tribes of Kafirs. The carving tool of the Bechuanas is more like a chisel; a blade like a thumb-nail in the end of a handle. The Japanese knives are numerous and peculiar.[129]

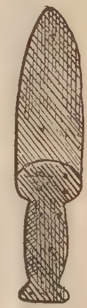

Fig. 79.—*Blackfoot scalping-knife.*

Fig. 79 is a leaf-shaped dagger or scalping-knife, of iron, with a bone handle, such as is used by the Blackfeet and Sioux. C. Carver, in his "Travels," says that the leaf-shaped dagger, made in his time of bone, was peculiar to the Nadowessioux, or that family later known as the Da-ko-tahs or Sioux.

There is one class of weapons for grappling at close quarters, which may be mentioned here, as it was shown in the exhibit from British India. The *baymak* is a five-clawed weapon hidden in the hand, having loops through which the first and fourth fingers are passed. When the hand is opened, the steel claws, like those of a lion, are exposed, and are intended to rip the naked belly of the adversary. The term *baymak* is understood to include several forms of weapons, such as brass knuckles and spikes which are carried in the hand.

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[127] Wood, vol. i, p. 103.

[128] Casalis' "Basutos," p. 136.

[129] Siebold's "Nippon," vii, plate 19, Figs. 3, 4, 5, 6.

The Samoans have a somewhat similar weapon—a glove made of coir, and having on the inside several rows of shark's teeth, set hooking so that they retain anything which is grasped. Like the *baymak*, it is intended to rip the abdomen of an enemy. To guard themselves against this weapon the Samoans use a heavy and wide belt of coir, reaching from the arm-pits to the hips. This belt was the nearest to the nature of clothing of anything in the islands; a number of cords of sinnet are strained on two parallel sticks about 36 inches apart; the sinnet weft is then worked in over and under alternate threads.[130]

The *bague de mort*, seen by Stendhal in Rome,[130a] is like the East Indian *baymak* in the mode of hiding it in the hand, but it has only two claws, which are of steel, very sharp and like those of lions. The piece to which the claws are rooted is held in the hand by rings, through which pass the second and third fingers, beneath which the claws are hidden, nothing appearing but the rings. Poison is placed in grooves channeled in the claws, like the poison groove in the fang of a rattlesnake.

Stendhal says: "Dans une foule, au bal par example, on saississait avec une apparence de galanterie la main nue de la femme dont on voulait se venger; en la serrant et retirant le bras, on la déchirait profondément, et, en même temps, on lassait tomber la *bague de mort.* Comment, dans une foule, trouver le coupable?"

The Djibba tribe of the Upper Nile wear bracelets for cutting and tearing, the edge being protected by leathern sheaths when the weapon is not required for duty. Some of them have double jagged edges and others a single sharp edge.

The Nuehr carry on the wrist an iron ring with projecting blades.

The Roman boxing gauntlet, *cestus*, was a much less sanguinary affair, being merely armed with lead or with bosses.

We pass from knives to swords; which is but to an implement of a larger kind. The sword proper is a weapon, but the machete of the Spaniard, the corn and cane knives of the plantation and farm, are domestic implements of similar character, but with less ornamental furnishing. Where vegetation is as large as that of the corn or sugar-cane, a sword-like implement is necessary in gathering it, and the same large knife is used in tropical countries in cutting away the vines and creepers which obstruct the narrow passes through the woods.[131]

Of the cruder materials, stone and wood, used in swords, the Exhibition furnished but few examples. Some of the clubs already considered had sharpened edges and approximated the sword character. The New Zealand stone sword, Fig. 80, can hardly be classed under any other head, as it has a handle, a back, and an edge, and is adapted to deliver a cutting blow. The swords of the Pelew Islanders are of wood inlaid with pieces of shell.[132] The Kingsmill Islanders have wooden swords, armed on their edges with sharks' teeth lashed with sinnet braided from the fiber of the cocoa-nut. The wooden blade has grooved ridges to receive the teeth, corresponding holes being made in the ridges and teeth through which the braided cord is repeatedly passed to fasten the teeth in this artificial alveolar ridge. The swords are single or double edged, and have guards similarly armed with teeth, so that no part of the weapon except the handle can be touched with impunity. The spears are similarly armed, like some which were shown from the Philippine Islands. A fine assortment of those weapons, obtained by the Wilkes Expedition, is in the National Museum at Washington.

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[130] Wood, vol. ii, p. 354.

[130a] "Promenades dans Rome," vol. i, p. 267.

[131] Raffle's "Java," 4to, p. 113.

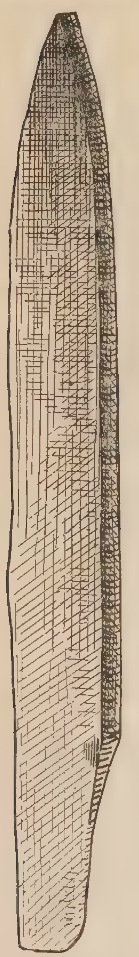

FIG 80.—*Maori stone sword.*

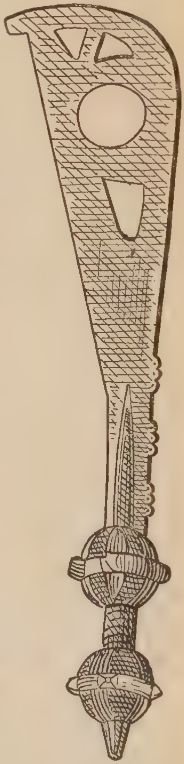

FIG. 81.—*Sword of the gold coast, Africa.*

The gold-coast section of the English colonies presented two curious swords with broad, thin blades, especially wide near the point. The perforations make the blade still lighter. The tang is set in a wooden handle with two knobs, between which is the hand-hold. Fig. 82 has a double blade, and is referred to as an "executioner's sword"; a weapon in much demand all around that part of the world, especially Dahomé. The two blades of Fig. 82 are united at a point where the flattening of the blades commences. The blades are 24 inches long; the carved handles are 8 inches long, and one of them is gilded.

The swords of Dahomé[133] have knobs on the ends of the blades, so that they may be used as clubs. One noticed had a knob carved like a human head. The back of another had a series of backwardly-curved prongs, intended as hooks to catch a pursued enemy. The classic *harpe*, the sword of Mercury and Perseus, had a similar prong, *hamus*. Another sword of bloody renown is the weapon of the "Razor Women," who form one battalion of the Dahomé Amazons. The weapon is copied from the white man's razor, but has a blade 2 feet long, and a handle of proportionate size. A spring holds the blade open. It is as if, in a jocular spirit, some trader had foisted an absurdity upon them; but the natives claim it as an invention of the late King Gezo. The real razor of the Ashantee is of a nearly trapezoidal form; this latter is for legitimate shaving.

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[132] Wood, vol. i, p. 449.

[133] Duncan's "Western Africa," p. 226.

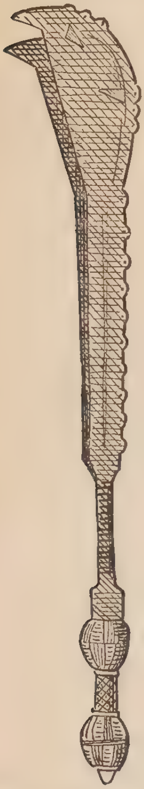

FIG. 82.—*Two-bladed sword of the gold coast, Africa.*

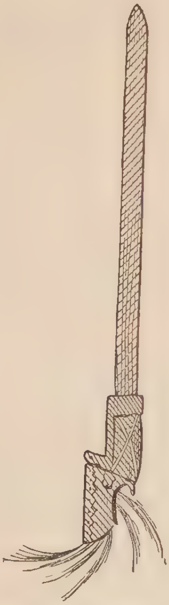

FIG. 83.—*Sword of Angola, Africa.*

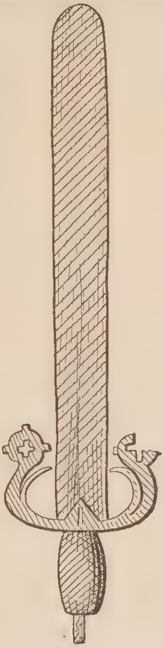

FIG. 84.—*Sword of Mozambique, Africa.*

Coming southwardly along the coast of Africa we arrive at Angola, which, as we have already had occasion to remark, was well represented in the Agricultural Building. Fig. 83 is a sword made by a native armorer of Angola; it has a curiously-shaped hilt, and tufts of horse-hair stained red. The hilt is in part covered with sheet-lead. The gay appearance of the hilt, as it showed when sheathed and worn at the side, was probably its principal recommendation. The general shape of the African sword is curved, although of the examples from the Portuguese colonies two are straight and but one bent. The specimens illustrated from other sections of the continent will amply compensate for the present larger majority of straight-bladed weapons. Fig. 84 shows a native sword of Mozambique. It has a short wooden handle, from which the usual button on the end of the tang has dropped off. The guard of the hilt has a peculiar scroll shape, and one branch has been broken. The sword of the Hamram Arabs, of Central Africa,[134] is also straight, double edged, and has a cross-guard. The blade is 36 inches long, and each edge is as sharp as a razor. It is carried in a wooden scabbard made of two pieces, hollowed to receive the blade, and covered with leather. With this weapon the Arab will cut a man in two, or will hamstring an elephant.

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[134] Wood, vol. i, p. 753.

Fig. 85 is a steel cimeter of Mozambique, with a broad and very thin blade. It has a wooden handle ornamented with sheet brass enchased and jeweled. It is 40 inches long, and has a groove near the back of the blade.

Fig. 86 is a sickle-shape cimeter, brought by Col. Long (Bey) on his return from his expedition into Central Africa in the service of the Khedive. It was shown in the Egyptian Department in the Main Building, and is like the weapon represented by Schweinfurth as held by the Monbuttoo King Munza during the audience which he held with that potentate.[135]

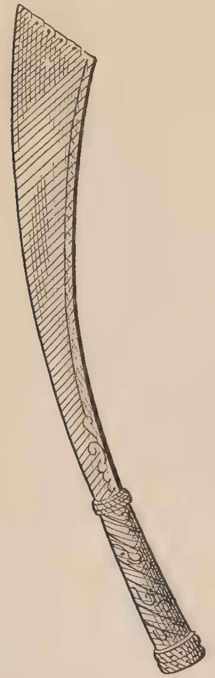

FIG. 85.—*Cimeter of Mozambique, Africa.*

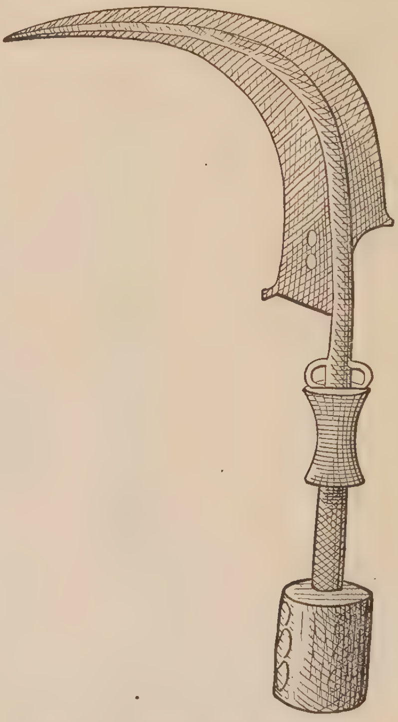

FIG. 86.—*Monbuttoo cimeter, Central Africa.*

It is usually of steel, but on that occasion was a weapon of ceremony, and made of pure copper. The adjacent tribe, the Niam-niams, use implements of somewhat similar shape, curved broad-ended blades, somewhat after the bill-hook order, reminding one of the corresponding Roman implement, the *falx vinitoria.*

The *kookery* of the Ghoorkas, a tiger-fighting hill tribe of India,[136] is another example of a boldly curved chopping-sword, broad near the end, and sharpened on the concave edge, which is, however, of an ogee shape. It is about fifteen inches long, is used either to cut or thrust, and is made of the famous "Wootz" steel. Two little knives are carried in side pockets of the scabbard.

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[135] "Africa," vol. ii, pp. 9, 10, 107.

[136] Wood, vol. ii, p. 760.

Fig. 87 is a saber brought by Capt. Long (Bey) from the Soudan Expedition. It has a boldly curved steel blade and a wooden handle. The sheath and belt are of leather. The Nubian cimeter is, perhaps, even a little more curved than that shown from Soudan; but doubtless the weapons of a district vary, and are not confined rigidly to a certain curve, as in some countries where such things are defined in the "Regulations." The curve in each case is much greater than that of the *κόπις*, the eastern cimeter of classic times. The Apongos use a cimeter of similar shape, and with a handle shaped like a dice-box. The blade is 4 feet long. No other cimeter of Africa has so peculiar a bend as the *shotel* of the Abyssinians.[137] The blade is nearly straight for two feet, and then suddenly makes a turn of about sixty degrees. The edge is on the concave side, and it is intended that the point shall reach over the top of an enemy's shield. The blade is wider and heavier toward the point. It is of soft iron, has a rhinoceros-horn handle, and is swung on the right side.

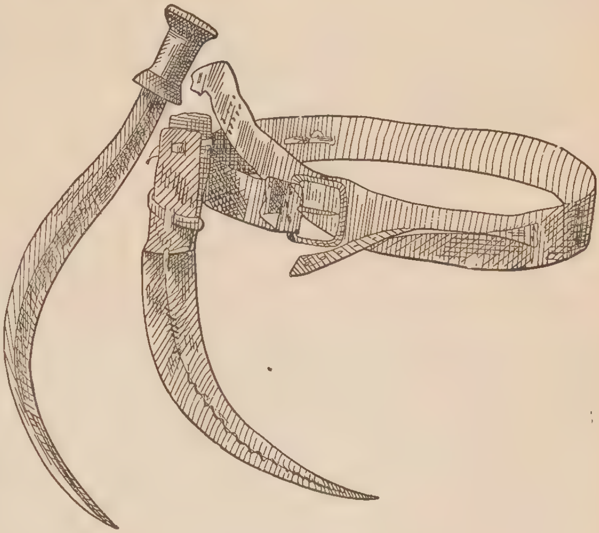

FIG. 87.—*Saber of Soudan, Africa.*

Among the most curious weapons of the savage world are the hurling cimeters—if they may be so called—the *trumbashes* of the Niam-niams.[138] The term is from Sennaar, and refers generally to the missile weapons of the negroes. The *trumbash* of the Niam-niams (*kulbeda*) Fig. 26, consists ordinarily of several limbs of iron with pointed prongs and sharp edges. Somewhat similar implements are used by the tribes of the Tsad basin, and a weapon on the same principle is used by the Marghy and Musgoo. The Niam-niams carry them attached to the insides of their shields ready for duty, and hurl them with great rapidity, force, and accuracy. They are made by the skillful smiths of the Monbuttoo tribe of the Welle River. A hurling axe shaped like a sickle is also used by the troops of the scheik of Borneo. It is known as a *hunga-munga* and somewhat resembles the *trumbash* of the Niam-niams. The Tibboos, west of Nubia, use a missile sword, as do also the Fans of Western Africa. The Fan weapon is flat and pointed, and near the handle is a sharp projection.

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[137] Wood, vol. i, p. 718.

[138] Schweinfurth's "Africa," vol. ii, p. 10.

The Malays and Dyaks have several swords, as they may be called, of peculiar character. Three of them are cutting weapons; the other is a thrust. The three former are *parangs;* the latter is the *kris.*

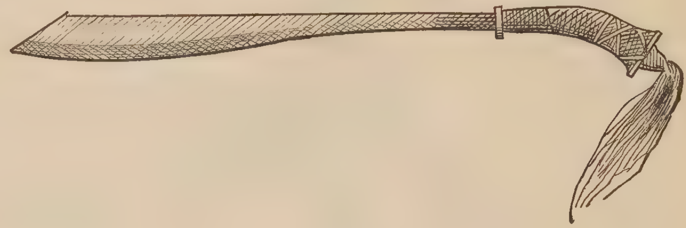

FIG. 88.—*The parang of the Malays.*

The *parang*[139](Fig. 88) has a two-edged blade which is small but thick at the handle, and runs broader and thinner to near the point. It is elaborately ornamented with tufts of human hair and charms. The handle is frequently of deer bone neatly carved, but in the present instance is of wood bound with red leather and has a tuft of human hair at the hilt. The scabbard is of red wood, carved. A ratan-splitting knife[140] occupies a pocket in a small sheath attached to the scabbard of the *parang.* This attaching of a knife to the scabbard is also found in Scotland and Central Africa. The *parang-latok* is made of a square bar of ½-inch steel, which is gradually thinned and widened until it reaches a width of two inches near the point. It has a peculiar bend of 30° near the hilt. It is sword, machete, axe, all in one, being the ordinary weapon of the men and many of the women. It is kept in a wooden sheath made of two pieces of wood hollowed out and bound together with ratan. It is the executioner's weapon. The *parang-ihlang* is straight. Its blade has a curious shape, being ogee in cross-section. This shape seems to give it wonderful execution in cutting, but at the same time makes it dangerous to an inexpert swordsman, as the blade glances in a remarkable manner. The beheading sword of the piratical Illaños[141] has a somewhat similar curve. The holes in the Illañoon sword indicate the number of victims.

The most characteristic, however, of the Malay weapons is the *kris*[142] (Fig. 89), which is used in thrusting, as a Spaniard uses his knife. The armorers take as much pride in the making of the weapon as of old did the Toledo or Ferrara workmen. The blade is generally waving, and its grain is more marked than in any other weapon, as much so in fact as the Damascus gun-barrel, and for the same reason, as it is made of steel and iron strips laid together, twisted, doubled, and variously convoluted to give the kind of marking required. These are rendered more plain by etching the blade with lime juice, the acid corroding one metal more than the other, and hence leaving the surface grooved. The execution *kris* is also used as a thrust weapon, the *parang-latok* being used for beheading. The culprit or victim, as the case may be, sits in a chair, and his extended arms are held by two persons. The executioner stands behind and places the point of the kris just by the left collar bone, and strikes it downward, piercing the heart. If he be fastidious he places a pledget of cotton wool around the point of the *kris* before thrusting it into the thorax, holds it there tightly, so as to wipe the weapon on its recovery, thrusts the wool into the gap, and thus avoids shedding a drop of blood.

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[139] Boyle's "Dyaks of Borneo," 114, 115;
Belcher's "Eastern Archipelago," ii, 133 and plate.

[140] Belcher's "Eastern Archipelago," vol. i, pp. 230, 231.

[141] *Ibid*, vol. i, p. 266.

[142] Raffles' "Java," 4to, i, p. 296 and plates; Wallaces' "Malay."

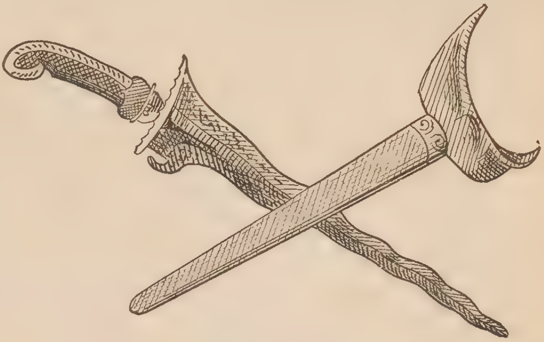

Fig. 89.—*Malay kris.*

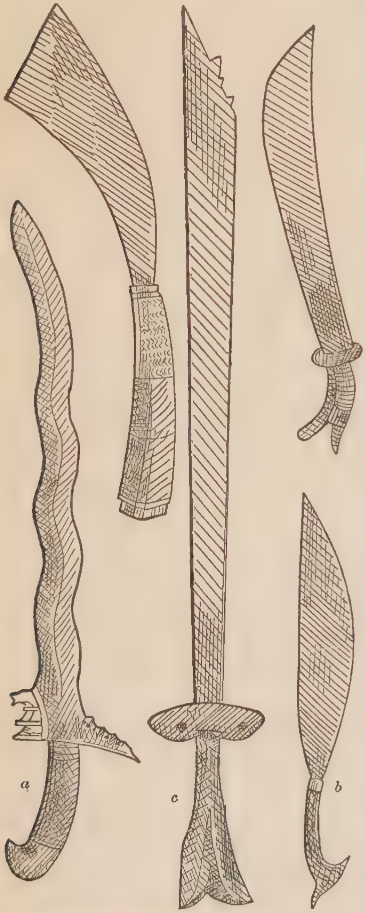

Fig. 90.—*Swords of the Philippines.*

"A most delicate monster."

It may be added that the kris is the most cherished possession of its owner, and may be worth $20, when his clothing would not command 25 cents. Some krises are heavily inlaid with gold. The sheath is of wood and comparatively plain. The size of the weapon is usually from 12 to 15 inches long, but larger ones are to be seen. Some authorities have told us that the handle is always bent at right angles to the blade. In the Javan collection of the Dutch colonies in the Main Building the handles were as represented in the figure.

Five swords of the Philippine Islands are represented in Fig. 90. They were in the Spanish Government Building. The resemblance to the Malaysian implements is very marked; *a* is evidently a *kris; b* is a *parang; c* is a *parang-ihlang.*

The Siamese sword[143] used from elephant back has a handle four feet long of heavy wood and a screw-joint in the middle to make it more portable. The blade is one-edged, two feet long, and gently curved. The guard is a disk set with gems and the scabbard is enameled.

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[143] Ruschenberger's "Voyage Round the World," p. 295.

The Chinese use single swords, sometimes one in each hand; they also have two-handed swords.[144] The warrior armed with two makes them fly like the sails of a windmill, he leaping and dodging the while. The two-handed sword is of the same length and weight as the one exhibited from Norway. The Chinese also use a sword blade on the end of a pole. The practice of the Japanese of rank in carrying two swords is familiar from the many illustrations on the fans, which are so good and cheap. The swords are known as *ken* and *katten*. Some of the old Japanese swords have blood lines.[145]

The Norwegian two-handed sword of some centuries since was shown in the collection from that country in the Main Building. It has a whole length of 5½ feet and a hilt 15 inches in length. It has two hand-holds on the hilt and one above the hilt, probably to hold it when used as a pike.

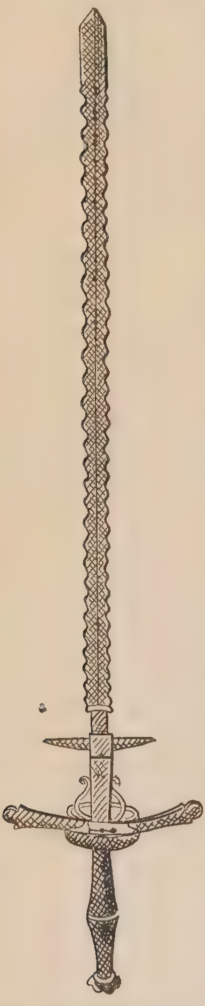

FIG. 91.—*Norwegian two-handed sword.*

IV.—SPEARS.

The spear is found among most savage nations and was the knightly weapon in Europe until the introduction of fire-arms. It, however, continued in use among the Poles, Russians, Turks, and Tartars, and was introduced into the armies of Prussia by Frederick the Great; the Austrians followed, calling the troops Uhlans, and lances are now found in most of the European cavalry forces. A number of lances were made for a cavalry regiment in the army of the Potomac, but the project was abandoned and the lances laid away in the arsenal in Washington.

Perhaps we may assume that the first spear was a sharpened stick or pole; such a one was shown in the collection from the Argentine Republic, a round pole a little larger than a hayfork handle, of dark wood and 10 feet long. The point was a simple taper without any attempt at hastate form.

A common spear of Borneo and the Philippines is a sharpened bamboo, such as shown at *a b*, Fig. 92. In one case the shaft is of bamboo, and in the other a bamboo head is slipped upon a cocoa-wood shaft. The end is so sharpened that the hard silicious skin of the bamboo forms the edge and makes a very efficient cutting and piercing weapon. The spears *c d* are of cocoa wood. The head of *c* has an ornament resembling six diminishing ears of corn with a round finial point. Similarly ornamented spear heads are made in Fiji. The other (*d*) has six gradually decreasing sets of barbs crowned by a finial. Other spears from the Philippines had shark's teeth tacked to ridges on the head, and some had metallic heads. They will be shown presently.

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[144] Wood, vol. ii, p. 814.

[145] Siebold's "Nippon," ii, plates 3, 5 *bis*, 12.

Jagor mentions that the spear (*pica*) of the Philippines is of caryota wood 2.27m long; the head of bamboo, carved wood, or iron (purchased).[146]

The large spear of the Sandwich Islands[147] is 12 or 15 feet long and is not barbed, but the hurling spear is 6 or 8 feet long, of hard wood, and tapers toward the butt, to throw the center of gravity forward of the mid-length and enable it to fly straight.

The Fijians,[148] who excel in ingenuity, have several kinds of spears. The fishing spear has three or four points set in separately. Each point has a round, square, or semicircular section, is dovetailed into the shaft and lashed thereto with *sinnet*. The war spear has a carved head, and barbs, either cut in the wood, or made of the tail of the sting-ray and set in separately; these brittle barbs come off in the wound and insure cruel suffering and generally death. One Fijian spear is made of a wood which bursts when moist, so that it is with difficulty extracted. The different islands, such as the Tonga, Herveys, Fiji, and the New Hebrides have distinguishable varieties of spears.

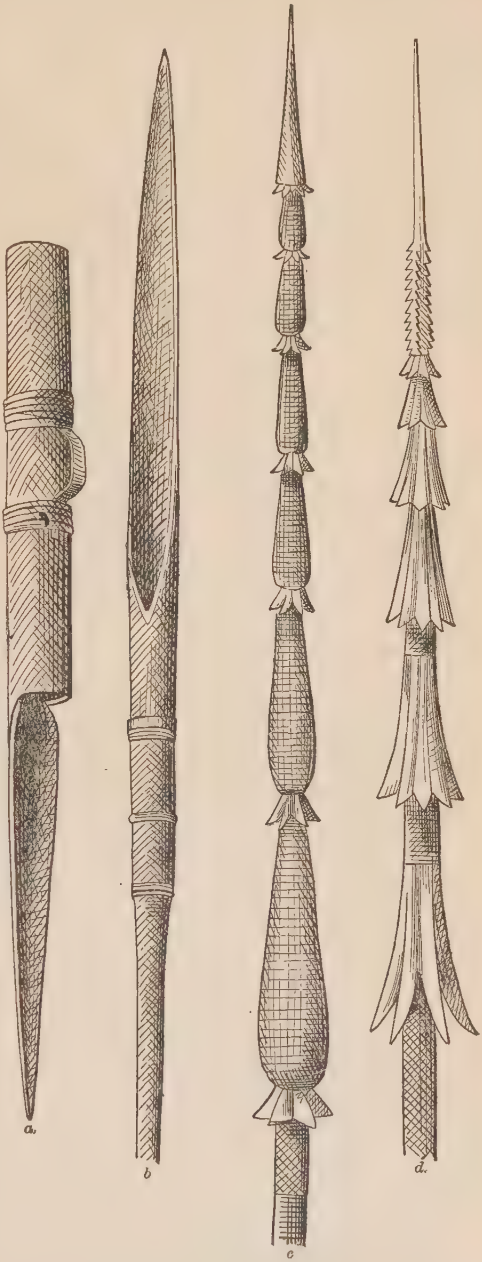

FIG. 92.—*Spears of the Philippines.*

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[146] "Philippines," p. 210. [147] Wood, vol. ii, p. 434. [148] Williams "Fiji," pp. 44–5.

The Australian spears are of various qualities and shapes: a sharpened stick (*nandum*) with notches for barbs; [149] a spear with a separate head of hard *miall* wood deeply cut with barbs, and fastened to a reed (*phragmetes communis*) shaft; [150] one with a basalt or quartzite head lashed to the shaft with sinews from the tail of the kangaroo,[151] with long projecting barbs on each side, curiously formed from hard wood,[152] a single bone lashed to the head and projecting laterally and backwardly from the point so as to form a barb; the *mongile*, a head armed with sharp basalt or quartzite flakes set with *pid-jer-ong* gum; [153] one with a head piece of bone which is lashed to the shaft so that its respective ends form point and barb; [154] lastly, leisters with from two to four barbed points,[155] and from 6 to 15 feet long.

The flower stalk of the grass-tree furnishes the spear-shaft, which is 9 or 10 feet long. Fig. 93 shows two South Australian spears, one with a double set of inserted barbs made of obsidian or quartz, and a kangaroo spear with a wooden head 30 inches long, and a single row of barbs; the shaft is 8 feet long. Fig. 94 shows two fish-spears, one with two prongs and the other with three. The prongs of hard and tough gum-tree wood are tapered towards each end, pointed, and barbed; their butt-ends are then inserted in notches on the end of the shaft and held in position by black-boy gum, while the prongs are spread apart by wedges driven between them. The prongs are then lashed with sinews. The Australian has a blade on the end of his spear to act as a paddle as he stands in his dug-out canoe and watches the water or quietly moves from place to place. The night is the favorite time for fish-spearing, a fire being made on a bed of wet sand and stones in the bottom of the canoe. The natives also carry torches of inflammable bark; this mode of fishing is common in North America and in Scotland, called "burning the water" in the former, and "leistering" in the latter.

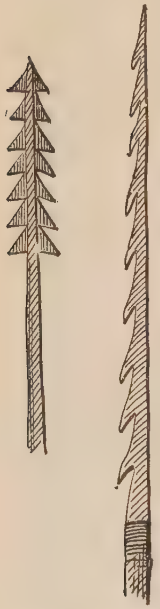

FIG. 93.—*Australian wooden spears.*

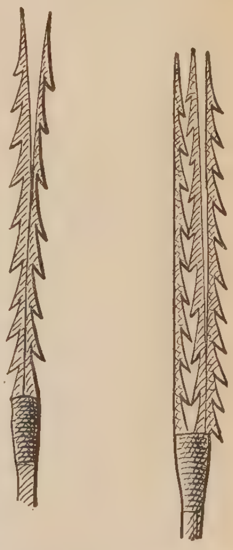

FIG. 94.—*Australian wooden fishing-spears (leisters.)*

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[149] R. Brough Smith, "Aborigines of Victoria," vol. i, p. 304, Fig. 71–74.

[150] *Ibid.*, vol. i, p. 305, Figs. 75, 76.

[151] *Ibid.*, vol. i, p. 308, Fig. 85.

[152] *Ibid.*, vol. i, Figs. pp. 69, 70, and i, 308, Fig. 84.

[153] *Ibid.*, vol. i, p. 304, Fig. 68, and i, 336, Fig. 141.

[154] *Ibid.*, vol. i, p. 306, Fig. 77, 78.

[155] *Ibid.*, vol. i, p. 306, Figs. 79, 80, p. 337, Fig. 144 *et al.* See also Pl. iv, and pp. 33–5 Nilson's "Stone Age."

The large spear of the Australian, not to be thrown but used as a pike, is as much as 13 feet in length, the head of hard wood, the shaft of lighter wood, and as large as the wrist. The Australians also use a forked spear, *bobo*, to secure eels and snakes alive.[156] The turtle harpoon, like the hippopotamus harpoon of Africa, has a head detachable from the shaft. To the head is attached a rope, on the other end of which is a buoy. The harpoon for the dugong has a bone head 4 inches long and covered with barbs. It becomes detached from the shaft after striking; the cord attached to the spear-head has no float, but is secured on board the canoe. The simplest form of fish-spear is a long sharp stick used in gigging fish in water-holes.[157]

The spears in the New Zealand department were all of wood. Some were simply pointed poles of hard wood; others had carved heads with pyramidal points. The spear is not a favorite weapon of the Maoris; in fact is said to have been laid aside. The heads of the spears are understood to be a conventional representation of the human tongue thrust out. That shown in Fig. 95 is destitute of ornament; Fig. 96, called by the natives *taiaha kwra*, has suspended tufts of dyed hair.

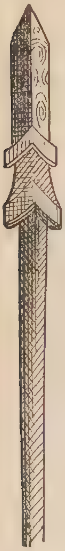

FIG. 95.—*Maori wooden spear.*

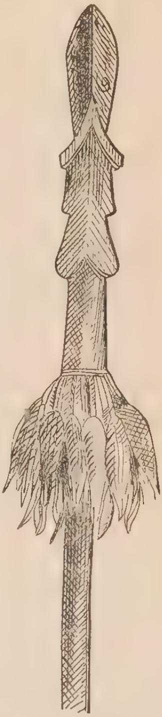

FIG. 96.—*Maori spear taiaha kwra.*

The styles of ornamentation peculiar to New Zealand, New Guinea, and Fiji are referred to by R. Brough Smith.[158]

The harpoon of the Andaman Islander[159] is shot from a bow, and has a detachable head with a connected cord, which is held by the archer.

The spears already considered are made of wood, although the use of the tail of the sting-ray by the Fijians and of bone and obsidian by the Australians have been incidentally mentioned. Materials in great variety have been used for the heads or barbs of spears.

Stone spear-heads were shown in the South Australian department. They were obtained from the northern part of the island near Melville's Island. They are genuine specimens of the stone age, which does not represent a specific time but a grade of civilization. Consideration must also be had to the absence of metals in some localities. The stone spear-heads are chipped to shape and lashed to reed shafts with sinews, or with fiber obtained from roots. The reeds are 6 feet long and the heads from 4 to 6 inches.

The spears of the Solomon Islanders are tipped with sharp flints; those of the Admiralty Islanders are of obsidian lashed to the shaft and coated with gum. The Mexican spears were pointed with obsidian. The obsidian spear-heads of the Papuans excited the surprise of Schouten, an early navigator in those seas; he remarks that they had "long staves with very long, sharp things at the ends thereof, which, as we thought, were finnes of black fishes."[160] The aborigines of the Canaries, a race of African origin, when first discovered, used hatchets, knives, lancets, and spear-heads of obsidian, and axes of green jasper.

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[156] Aborigines of Victoria, vol. i, p. 307, Fig. 82.

[157] *Ibid.*, vol. i, p. 307, Fig. 81.

[158] *Ibid.*, vol. i, pp. 296, 297.

[159] Mouat "Andaman," p. 326.

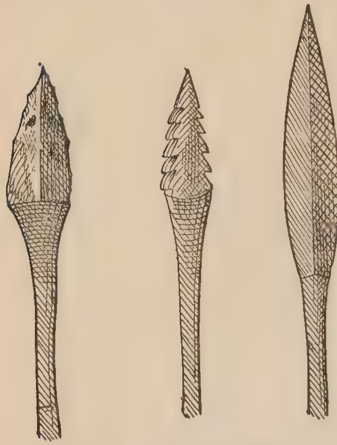
FIG. 97.—*Stone spear-heads, South Australia.*

The lances found in the upper strata during the excavations at Hissarlik[161] were of a very hard black or green stone. The spear of the Northern American Indian was formerly of stone or flint, but is now of steel.[162]

We may refer in a single group to those spears which are tipped with animal material, bone, horn, shell, shark's teeth, claws of beasts and birds (such as of the kangaroo, cassowary, or emu), and the tail of the sting-ray. In the times of Herodotus and Strabo, African spears were headed with the sharpened horns of antelopes,[163] and the practice still obtains.[164] The Canary Islanders, when discovered, in the fourteenth century, had spears and digging-sticks tipped with horns.[165] Fig. 98 shows two Kajäk spear-heads and a hook of bone, exhibited in the Greenland section of the Danish department. The upper one is cut down so as to leave barbs. The next beneath it has an iron tip riveted to the bone. The lower example is a bone hook about 2 inches across. Barbed harpoons of bone, from a Scanian bog, Sweden, from a cave in Perigord, and from Terra del Fuego, are shown in Nilson's "Stone Age."[166]

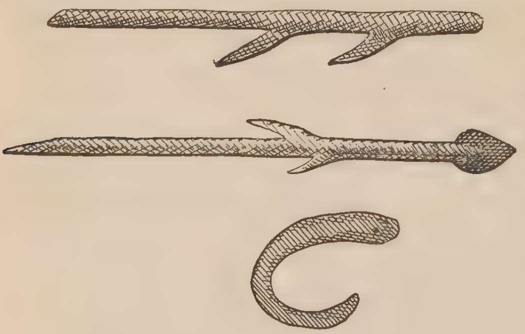
FIG. 98.—*Bone spear-heads and hook, Greenland.*

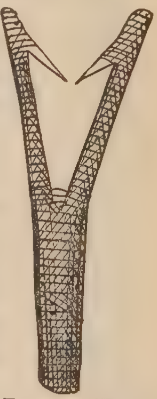
FIG. 99.—*Wooden fish-spear. Makahs of British Columbia.*

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[160] Purchas, vol. i, p. 95.

[161] "Schliemann's Troy, &c.," p. 79.

[162] Dr. Abbott in Smithsonian Report, 1875, pp. 269, 274.

[163] Herod., vii, 69–71. Strabo, xvi, 4, 9, 11.

[164] Andersson, p. 15.

[165] Tylor, p. 222, and note *passim*.

[166] Plate iv, Figs. 69, 70, 72.

Fig. 99 is a fish-spear head of wood with incurved points or barbs of bone; the binding is of cherry bark. These hooks are used by the Makahs and other Northwestern Indians.

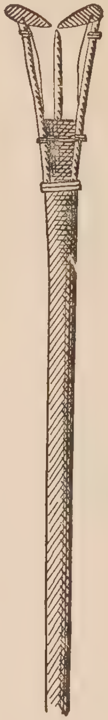

Fig. 100.—*Chookchee fish-spear, Siberia.*

Fig. 100 is a fish-spear of the Chookchees (*Tschucklochies*) of Northeast Siberia. It has a long stout shaft of pine wood, only one-half the length of which is shown. The head consists of two baleen prongs, on the ends of which are lashed two incurved points of ivory, forming barbs. The same style of fish-spear is used by the Youcon Indians of the Mackenzie River country.[167] The Fuegan fishing-spear is 10 feet long and has an octagonal shaft with a bone head 7 inches in length, with a single barb.

The National Museum in the Government Building had specimens of whale and seal lances from Siberia, Alaska, and Greenland.

Fig. 101 is a seal-spear from the Chookchees of Northeast Siberia. It has a long spliced pine-wood handle and movable point of bone with a metallic tip.

Harpoons with movable[168] and immovable points[169] are shown in Sven Nilson's "Stone Age," edited by Sir John Lubbock.

Fig. 102 is a whaling-lance from the Ponook Eskimo of Alaska. It is pointed with a portion of a marrow-bone cut off obliquely so as to afford a long cutting-edge. The butt-end has a flattened piece to fit the throwing-board, which will be shown presently. The piece on the side is a spur or button to prevent the spear penetrating the whale too far. The Ostiaks, Chookchees, and Keriaks secure the same end by binding the shaft with raw sea-lion hide, which, drying, forms an immovable ridge. Fig. 103 is a whaling-lance of the Greenland Eskimo.

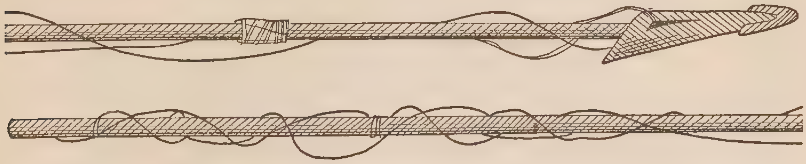

Fig. 101.—*Seal-spear of the Chookchees, Northeast Siberia.*

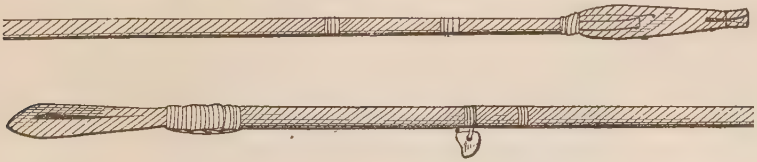

Fig. 102.—*Whaling-lance of Alaska Eskimo.*

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[167] Smithsonian Report for 1866, p. 324.

[168] "Stone Age," Plate iii, Figs. 52, 53 (for bladder spears).

[169] *Ibid.* Plate iii, 41, 50, 51; Plate iv, 69, 72 (bone tips and bone tipped with stone).

It has an iron snow-rest at the end of the wooden stock; the shaft is of iron and has a walrus-ivory point, which comes free of the shaft when the whale is struck. The shaft is dragged by the whale, and a float may be secured to the end of the thong. The thongs for the Eskimo harpoons are made from the skins of a large species of seal. Incisions six inches apart are made completely around the body and the rings of hide removed like so many hoops. These are then cut spirally into thongs of a length equal to the circumference of the body at the part multiplied by the number of times the width of the thongs goes into 6 inches. Fig. 104 is another whaling-lance of the Greenland Eskimo. It has a long bone rod for the attachment of the movable head which comes entirely free of the shaft, but is held by the thong. The shaft has a snow-rest at the butt.

The Makah Indians of the Northwest Coast use a lance and seal-skin buoy in capturing the great bow-head whales of the Pacific. Fig. 105 shows the buoy, rope, and lance-head. The head is placed on the end of a long forked pole and comes off the shaft after the whale is struck. The buoy is made of a seal-skin stripped off entire, sown up at the ends, and inflated. The lance-head is of shell with walrus-ivory barbs and point secured with sinews and pitch. The rope is of spruce root roasted in the ashes, pounded, frayed, and twisted. Fig. 106 shows the seal and fish-spear of the Eskimo of Kodiak, Alaska. It has a long slender ornamented shaft and movable barbed point. The shaft has a bladder float and an ivory knob to limit the penetration of the spear.

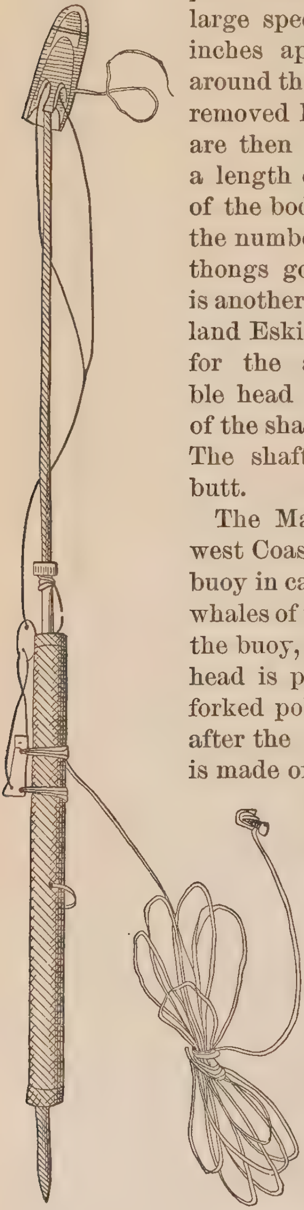

Fig. 103.—*Whaling-lance, Greenland.*

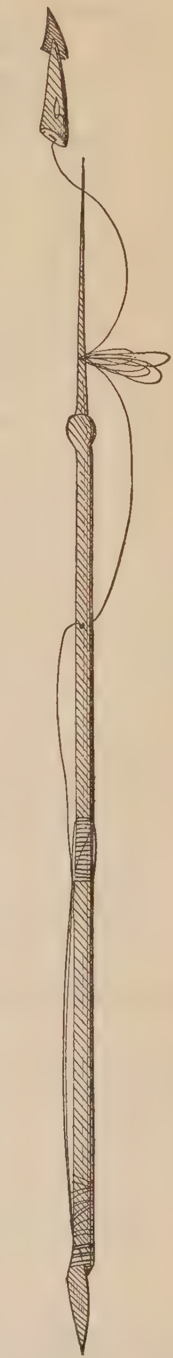

Fig. 104.—*Whaling-lance of Greenland Eskimo.*

The bird-spear of the Greenland Eskimo has, besides its main point, several supplementary points at some distance from the end of the spear. It has an inflated bladder to prevent its sinking in the water.

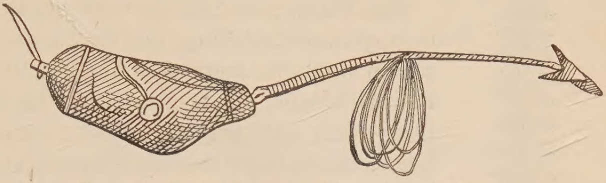

Fig. 105.—*Lance-head and seal buoy, British Columbia.*

A number of different Polynesian weapons are made with shark's teeth lashed to wooden clubs or lances. Fig. 107 is a spear-head exhibited in the Philippine Islands section of the Spanish department. The Kingsmill and Marquesas Islanders also arm the edges of their spears with sharks' teeth, binding them to the shaft with sinnet, the plaited fiber (*coir*) of the cocoa-nut. One from the Kingsmill Islands has over 200 teeth in a row, the shaft being of light wood and 15 feet long. A spear from the Philippines had 72 teeth in a row. A saw is made on the same principle by the Australians; flakes of obsidian or quartz, about the size of a quarter-dollar, are inserted in a grooved stick of gum-tree wood and fastened by gum from the grass-tree, commonly known as "black-boy" gum.[170] Javelins of bone or wood with longitudinal grooves, in which are inserted flint flakes, are shown by Nilson.[171]

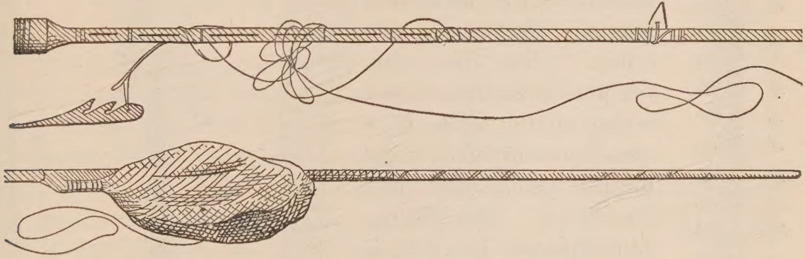

Fig. 106.—*Seal and fish spear, Kodiak Eskimo, Alaska.*

The spear of the Tonga Islands is barbed with the tail bone of the sting-ray; the same bone is used on the prongs of the Tahitian trident. The barbs are not fastened, but are slipped into sockets just tight enough to hold them until they are thrust into the body, when they become detached and, from their barbed character, work deeper and deeper into the wound.

We have considered wooden spears, and those with stone and bone heads, and incidentally some other materials. We now come to metal, the material of all the best, and which, once adopted, is not again laid aside.

Spear-heads of copper were shown among the Indian implements from Wisconsin. Copper preceded iron, being found native and malleable. Copper and bronze implements are among the articles recovered from the Egyptian tombs, the tumuli of Assyria, and the excavations of Hissarlik.[172] The spears of the Peruvians[173] were tipped with copper or bone, and those of the Inca lords mounted with gold and silver.

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[170] Wood, vol. ii, p. 35.

[171] "Stone Age," pl. vi, Figs. 124, 5, 6.

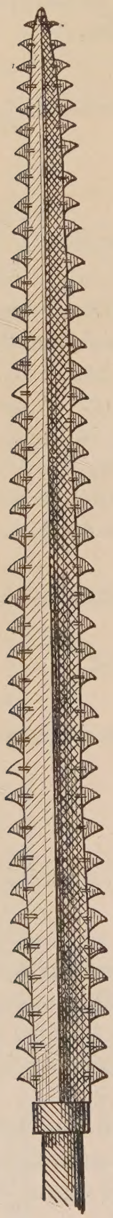

Fig. 107.—*Shark's-tooth spear of the Philippines.*

The Philippine Islands were represented in the Spanish Government building, and had a sheaf of spears, among which were the iron weapons, Fig. 108. One of these has a sword-blade, and a number of ferrules to prevent the tang from splitting the shaft. Another spear has two barbs, and a third one has a lanceolate head. The trident, Fig. 110, was also shown in the same collection. The *mora*, or cross-bar, to limit the penetration of the spears, shown in the Roman *venabulum* or hog spear, does not seem to be in common use in the Orient. The Japanese have as many as 14 kinds of spears,[174] perhaps more.

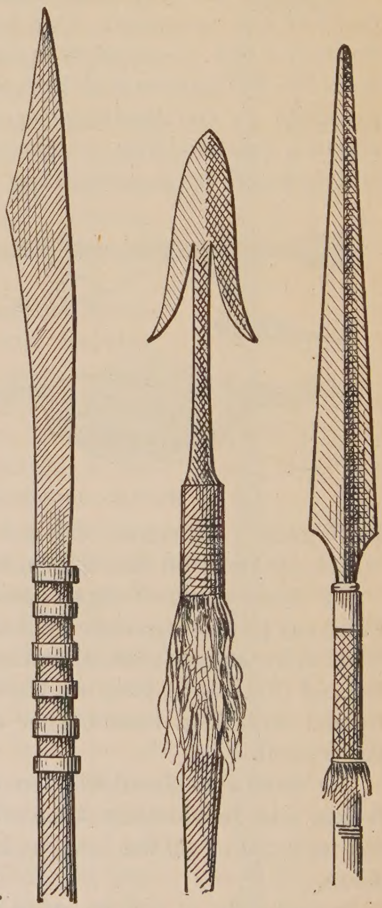

Fig. 108.—*Iron spear-heads of the Philippines.*

Fig. 109 is a three-pointed spear from Timor, shown in the collection from the Portuguese colonies. It has three simple points, the outer ones being on the ends of a cross-bar slipped over the middle prong and bent forward. The Philippine trident, Fig. 110, is used for fishing, but the Illañoon pirates[175] use a bifurcated spear with retreating barbs to catch men by the neck. The three-pointed spear is found in many widely separated parts of the world, and is mentioned in the history of the Saracen conquests, particularly in one of the feats of Ali. Fig. 111 shows three spears of the Island of Timor. They show the same tendency as to shape as the halberds and lances of the middle es. The weapons of Timor and of the Philippines are very similar, as ight have been anticipated.

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[172] "Troy and its Remains," p. 330. [173] "Conquest of Peru," vol. i, p. 73.

[174] Siebold's "Nippon," vol. ii, pl. 6. [175] Belcher's "Eastern Archipelago," vol. i, p. 252.

The African spears show a great variety. Over the large portion of the continent iron is either plentiful or readily accessible by means of the native traders. The metallurgic process is a direct one from the ore and the product is a steel. Weights, shapes, and sizes of the weapons differ greatly. The Bongos of the Upper Nile[176] are skillful blacksmiths and make excellent lances, especially considering the crude character of their tools. The spears of the Niam-niams and Monbuttoos[177] are of a hastate shape, and their weapons all have blood-grooves, which distinguishes them from the weapons of the Bongo and Mittoo. The Manganji spear[178] is sometimes made with a paddle or dibble at the end of the handle, and is weighted with iron rings.

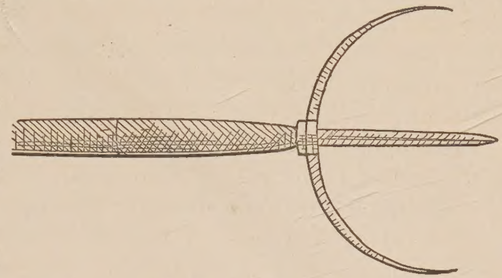
FIG. 109.—*Trident of Timor.*

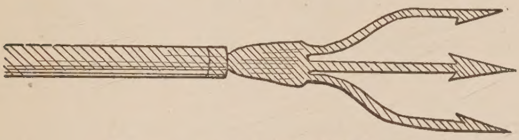
FIG. 110.—*Trident of the Philippines.*

The spear of the Kanemboo infantry soldier of Borneo is 7 feet in length, and armed below the head with a number of hook-shaped barbs. The Abyssinian spear is seven feet long and has four grooved sides. It is used either as a pike or a javelin. The natives have also a way of throwing it at close quarters by letting the shaft pass through the hand and catching the butt-end. The bark of a young tree being removed, the wood is seasoned by fire, greased, then hung in the sun to obtain the desired color.

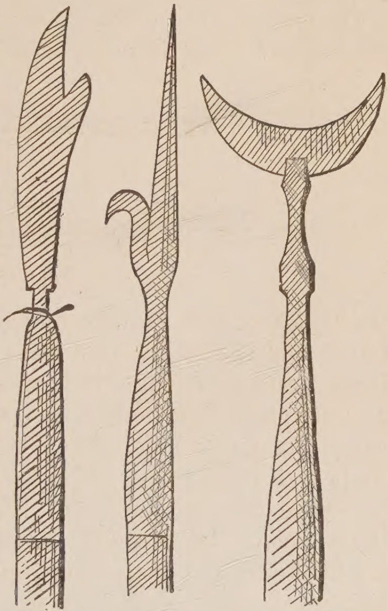
FIG. 111.—*Spears of Timor.*

The hippopotamus spear of the Zambesi[179] is a beam four or five feet long armed with a spear-head or hard-wood spike covered with poison. The spear is suspended from a forked pole by a cord, which, coming down close to the path frequented by the animals, is held by a catch and is free when the animal treads upon it. The Banyai of the Zambesi hav a hippopotamus spear with a wooden shaft, iron head, and weighted with stones; like the former, it is suspended over the track of the animals. The Fans of the Gaboon have a similar contrivance. The Dôr tribe prepares a similar spear, but the hunter climbs a tree and drops it upon an elephant passing beneath. The elephant spear of Unyoro is similar.

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[176] Schweinfurth's "Africa," vol. i, p. 280.

[177] *Ibid.*, vol. ii, p. 27.

[178] Livingstone's "Zambesi," p. 532.

[179] Livingstone's Zambesi, p. 107; Baker's Ismailia, Pl. opp., p. 135.

The hippopotamus harpoon of the Zambesi[180] has an iron head inserted in the end of a long pole of light wood. The head has a stout barb and becomes detached from the shaft; the rope attached to the head unreels from the shaft, and when it has all run out the shaft acts as a float to indicate the locality of the animal. An inflated bladder is sometimes used as a float. The rope is made from the bark of the *milola*, an umbrageous hibiscus. The Hamram Arabs use a float of *ambatch*, an extremely light wood. The Makobahs of Lake Ngami[181] attach the rope to the head by a large bunch of loose strands, which cannot be cut clean off by the teeth of the animal. A rope of palm leaf is attached to the shaft, and is coiled up in the boat.

The turtle-spear of the Central American Indians is a heavy palm-wood staff with a notched iron peg at the end, and twenty fathoms of silk-grass line attached.

The *assegai*, the hurling spear or javelin of the Kafirs, was shown in the Cape of Good Hope collection. It is a very formidable weapon in the hands of this athletic and untamed people. The people of "the Cape" say that the Kafirs are the remains of the lost "ten tribes of Israel," and have fought their way all down through Africa. Their assegais are made from native iron, have wooden shafts, and are decorated with tufts of cow hair. The blade has various symmetrical lanceolate shapes. A ridge passes along the center of the blade, which is concave on one side, convex on the other. This shape is intended to give rotation to the weapon. The head of the assegai is about the size of the blade of a table-knife, and has a tang which is inserted by burning it while red-hot into a shaft of assegai wood (*Curtisia jaginea*), which resembles mahogany. The two parts are secured by lashings of raw hide, which contracts in drying and holds all firmly. The *assegai* is the main weapon of the Kafir, and with it he kills his cattle, skins them, and cuts them up; with it he also carves his clubs, spoons, dishes, pillows, and milk-

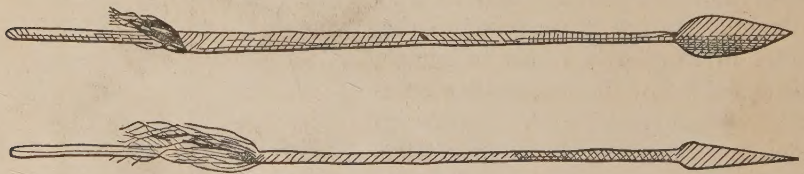

FIG. 112.—*Kafir assegais.*

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[180] Livingstone's Zambesi, p. 44.

[181] Wood, vol. i, p. 379.